ELECTRICAL REVIEW

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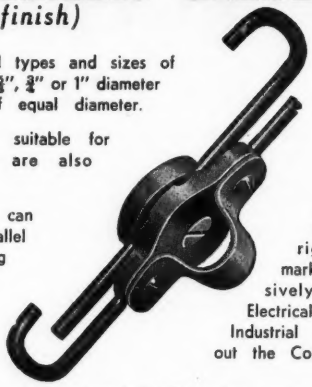

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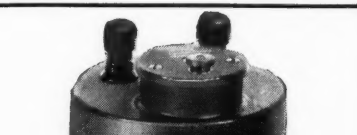

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ELECTRICAL REVIEW

Vol. CXLVII No. 3814 29TH DECEMBER, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Transformer Sheet

POSSIBILITIES OF HIGHER FLUX DENSITIES

BRITISH transformers are second to none in the world in point of design, construction and reliability, and overseas shipments continue high, notwithstanding the extended delivery periods. It is not enough, however, to supply transformers that are free from trouble; their electrical performance must not be allowed to fall behind that of transformers made in other countries.

Ever since the discovery of non-ageing sheet (" Stalloy ") by Sir Robert Hadfield in the first decade of the century, progress in this country has been along the line of silicon alloys. This method has been successful in reducing the watts/lb by something like 20 per cent at an increase in cost controlled by Government order, and by perhaps 30 per cent at an increase not so controlled. The increase in brittleness with silicon content sets a limit to the extent of improvement possible by this means in hot rolled sheet, on account of mechanical difficulties.

Cold Rolling

In the United States the use of cold rolled anisotropic sheet, of low silicon content, has been increasing since before the last war and it is now credibly stated that American transformers, up to the largest outputs and for the highest voltages, are almost exclusively constructed from this material. It is produced in continuous strip form, 18 or 24in wide, run off into rolls of convenient size, not in the familiar flat sheets in which hot rolled core plate has been supplied.

Grain Orientation

In high grade sheet the cold rolling process causes grain orientation in the direction of rolling. The material is ductile and easy to work, but cutting and punching disturb the orientation, so that subsequent annealing is necessary, preferably after core assembly. The magnetic properties are better in the direction of orientation and several methods of making the best use of it, such as winding the cores, or employing mitred joints, have been devised. Up to the present the production of directional strip in Britain has been on a small scale and the output has been mostly taken up by Service radar and radio equipment. For such apparatus it is usual to wind the strip into a loop, with a bonding material to hold it together, then to cut the loop in two, forming two " C " shaped sections.

In September last, however, a publication announced that English-made anisotropic core annealed strip is now available in flat lengths up to 18in wide, or as cut and punched laminations ready for

assembly. Interesting comparisons are made of a series of 10 kVA single-phase transformers of identical dimensions, but constructed from sheets of five different grades, ranging from hot rolled silicon sheet of 1·07 W/lb to cold rolled anisotropic strip of 0·55 W/lb, both at $B_{max} = 13{,}000$. Curves show that the rate of increase of the loss and of the magnetizing current, with increase of flux density, were markedly less in the anisotropic material. As designers know, cores built from various grades of core sheet do not always give the magnetic performance that would be expected from the intrinsic properties as measured by the normal loss testing apparatus. Tabulated results indicate that in the new strip the measured loss was usually nearer to the predicted loss than in hot rolled sheet—in one instance the measured loss was the lower. There would appear to be possibilities of working at higher flux densities than have hitherto been used in this country, but noise considerations will have to be taken into account.

PUBLIC LIGHTING

A noteworthy point in the B.E.A. report for 1949–50 was the rise recorded in the consumption of electricity for public lighting —33 per cent. It is strange that this coincides with complaints by numerous local authorities that the cost of their street-lighting has greatly increased since the Electricity Boards took over. Some of them no doubt have overlooked the fact that they are getting more light now than was the case three years ago. But possibly the chief reason for the higher charges is that they enjoyed rather favourable terms when they had their own electricity departments. Now they are being charged on a more economic basis.

POWER STATION TROUBLES

The further reduction reported by the B.E.A. in the capacity of generating plant out of commission on the winter peak is equivalent to so many new kilowatts. Such overall statistics can give no clue to the almost infinite variety of possible causes of trouble which may call for a detective-like skill in tracing. The discussion last week by the London Technical Group of the Electrical Power Engineers' Association, when members answered one another's queries (often with the aid of the chairman, Mr. G. M. Sichel) should be most useful. There seems much to be said for the recommendation of the question master, Mr. J. A. Vice, that on future occasions a team of especially knowledgeable engineers should be on the platform to add the weight of their experience.

POWER-CUT RISK

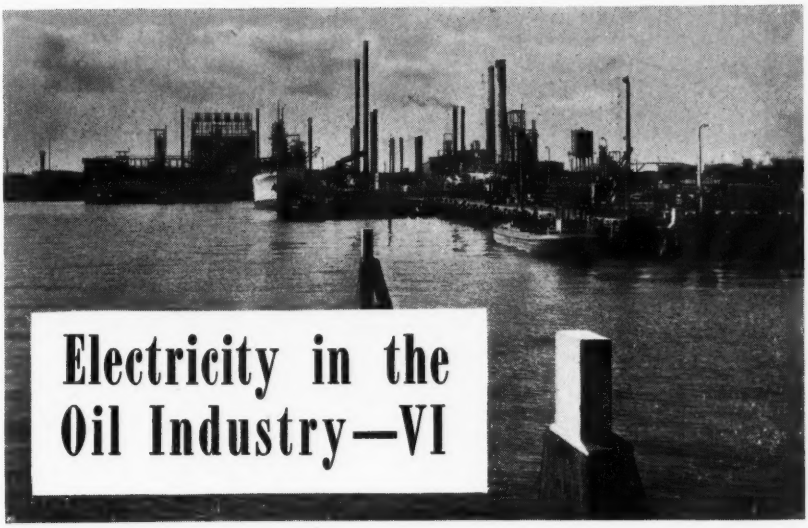
One unfortunate possibility in these days of power cuts is that appliances in use at the time of the cuts will be left switched on. It is the easiest thing in the world for a housewife to forget to switch off an iron or washboiler and then go out shopping. Already there have been fires and accidents, quite apart from burnt-out appliances. If the Electricity Boards are not taking active steps to warn consumers of this danger they should do so at once. Perhaps, too, the B.B.C. could couple a warning in its regular morning threat of power cuts.

SUPERVISING PUBLIC BOARDS

Protection of the public interest is ostensibly the first reason for nationalization, but almost inevitably the question "*Quis custodiet ipsos custodes?*" has arisen. In other words: How can public corporations be prevented from becoming more indifferent to the public interest than their predecessors were supposed to be? It is not an easy matter to determine, as is demonstrated in a study of the subject by the Acton Society Trust reviewed in this issue. In fact the Trust rather begs the question by suggesting that, after all, the public corporation may not be a satisfactory form of ownership. It is promised that this somewhat wider question will form the subject of a later study.

CONCESSIONS TO EMPLOYEES

Opinions differ about the propriety of concessions to employees. On the principle that the ox which treads out the corn should not be muzzled, many employers grant their staff special terms for the appliances which they make or in which they deal. This is the case in the electricity supply industry, but before nationalization a number of employees also received electricity at a lower rate than the public. Since vesting day this question has been a vexed one. Now it is proposed to abolish the system and to compensate those who have benefited from it. They will be offered three years' "purchase" but in exceptional cases where the concession has induced them to install much electrical equipment the compensation may be five years' purchase.



Electricity in the Oil Industry—VI

Methods Adopted at the Royal Dutch/Shell Refinery at Pernis

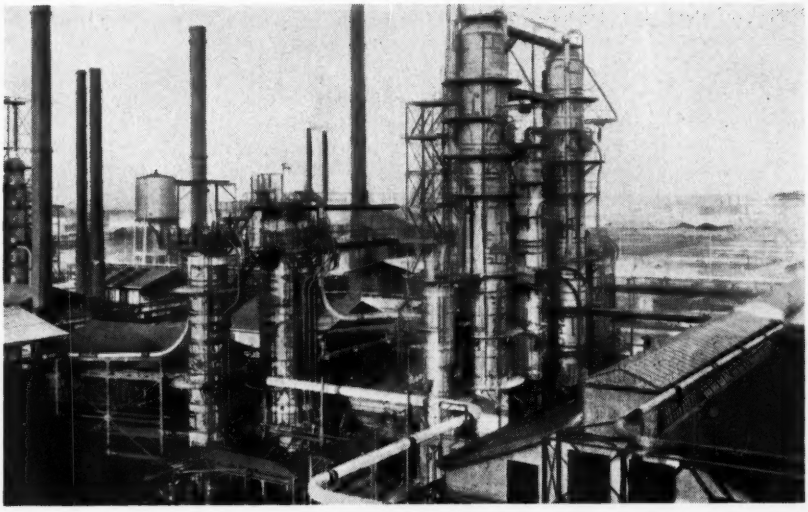
A GOOD example of the flameproof-only-in-danger-area type of installation is to be seen at the Royal Dutch/Shell refinery at Pernis, near Rotterdam, where the output of the Schoonebeek oilfields (already referred to) and imported oil are handled at the rate of approximately 10,000 tons a day, its output including roughly 29 per cent fuel oil, 30 per cent gasoline, 17 per cent gas oil, 5 per cent asphalt and 4 per cent lubricating oil as well as quantities of sulphur, p.v.c., detergents, etc.

Here at present the normal load is about 5,500 kW, with a maximum demand reaching 7,000 kW, and the monthly consumption is about 4 million kWh. These electrical requirements will be increased very substantially as new plant being erected comes into operation. To serve this new plant the 25 kV public supply is being taken to four new transformer substations situated on the edge of the refinery site out of the danger area. The incoming 25 kV supply from Rotterdam, controlled by 550 MVA switches, is taken at each of the substations to three 5,000 kVA 25/3 kV (Yorkshire Electric Transformer Co.) and three 1,000 kVA 25,000/380/220 V (Smit) transformers.

Throughout the substations, as everywhere else at the refinery, the basic requirement that the process must not stop has been kept in mind. Everything possible has been duplicated—feeders, switchgear and the process plant itself. All four of the substations are laid out on similar lines.

The first one we visited—that most nearly completed—will feed a 6,000 ton a day crude oil distillation unit, caustic treater and catalytic cracker. Controlling the 3 kV supply is a duplicate busbar board composed of Allen West 150 MVA switches. The 380 V switchgear is located in an adjacent but completely separate room. The oil circuit breaker board for the 3-phase power supply, manufactured by M. & C. Switchgear, Ltd., is arranged round three sides of the room, with an incoming feeder circuit breaker of 1,600 A

Our title picture shows part of the Pernis Refinery seen from the River Maas



New p.v.c. plant at the Pernis Refinery

capacity in the centre of each section. The three sections are connected through two bus-couplers, and the outgoing circuits, each of 400 A capacity, are so arranged that alternative supplies are available for all plants controlled from the transformer station.

The lighting distribution switchboard by Foster Transformers & Switchgear, Ltd., is located in the centre of the room, with the outgoing feeders placed back to back facing outwards and with two incoming circuit breakers and one bus-coupler forming the base of this "U" formation. All outgoing feeders are again duplicated, and, as in the case of the 380 V switchboard, all circuits are complete with ammeters and kWh meters.

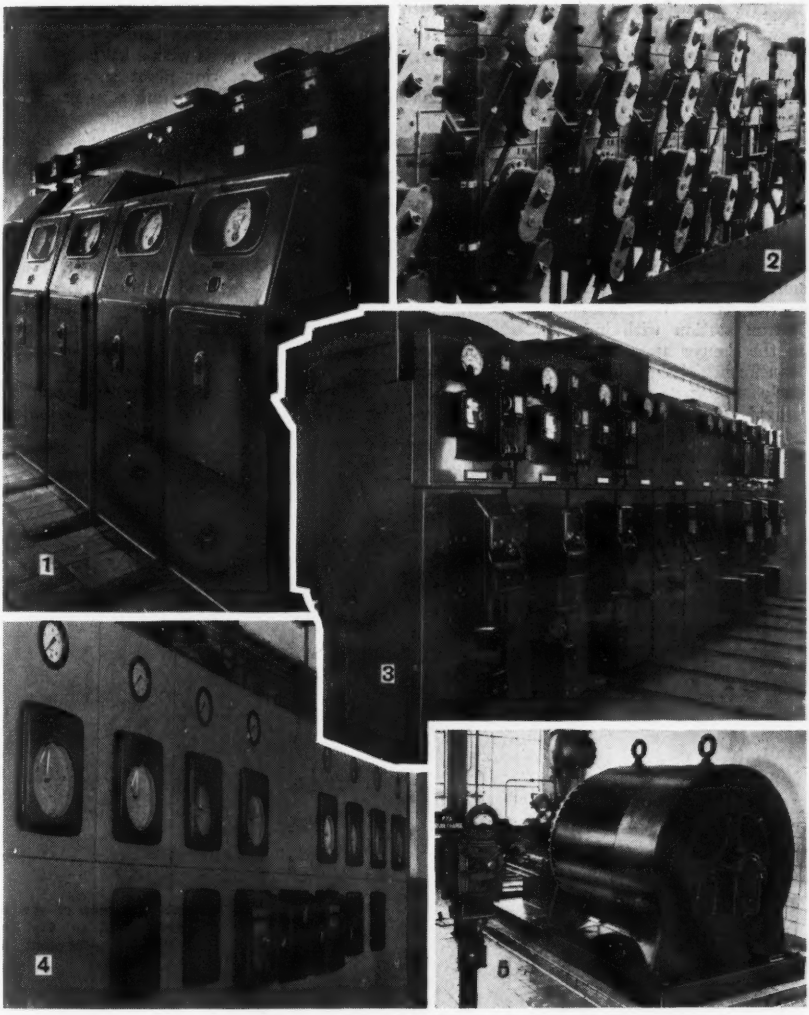
Two of the other three substations serving the chemical (p.v.c.) plants and the tank farm with shipping pump house, have been equipped as above, while the fourth, used to supply the cooling water plant, workshop and dewaxing plant, has a Crompton Parkinson 380 V oil circuit breaker board.

Satellite transformer substations are provided for certain plants, the 3 kV supply from the main substations being stepped down to 380/220 V for power and lighting. Such a substation just put into service feeds about 250 pieces of apparatus, including three furnaces and pumps of all sizes up to 200 h.p. at 380 V while for the higher horsepowers a 3,000 V supply is available from two 750 kVA Brush outdoor type transformers. A control room, fully equipped with instruments to indicate and record temperatures, pressures, etc., at all stages of production, is truly the nerve centre of such a plant. All equipment here is of flameproof construction. A substation for a crude oil distillation plant which has been in operation for some years is fed at 3 kV and the 150 MVA main switchgear installed there was made by Hazemeyer under licence from Reyrolles.

For the caustic treatment plant an outdoor switchboard just being completed, when we were there, provides a further example of the present-day practice of grouping together all motor control gear remote from the machines and is typical of installations now being adopted as standard. Protected from the weather by corrugated iron canopies only and sited well away from the danger area, it covers all supplies for the feed and recirculating water, caustic circulating and free soda pumps. As is usual throughout the refinery all the motors are started direct on line. The control gear used was supplied by M. & C. Switchgear, Ltd.

The M. & C. motor control gear, which is very much in evidence throughout the installation at Pernis, is specially noteworthy as an indication of the progress made in

standardization. By the use of interchangeable thermal overcurrent trip assemblies, either plugged in or fixed by two screws only, it is possible to use the same a.c. starter units for a range of motor sizes, one assembly being substituted for another within a few minutes. It is thus necessary to stock only a limited number of motor starters, namely 10, 25, 40, 80, 150 and 200 h.p. We understand that the recently developed thermal relay



(1) High voltage (3 kV) switchgear for dewaxing plant. (2) Back of motor starter switchboard showing twelve position universal gland arrangement. (3) 3 kV switchgear for cooling-water pump house. (4) Instrument panel in redistillation unit. (5) Flameproof remote push-button station, with ammeter, controlling pump

incorporated in these overload assemblies has passed exhaustive tests at the K.E.M.A. (Dutch Electrical) Testing Station at Arnhem.

Apart from this feature the design of the M. & C. standardized unit has been developed as a result of many years' experience in tropical climates and in particular at the new refinery at Cardón in Venezuela where operating conditions are especially arduous.

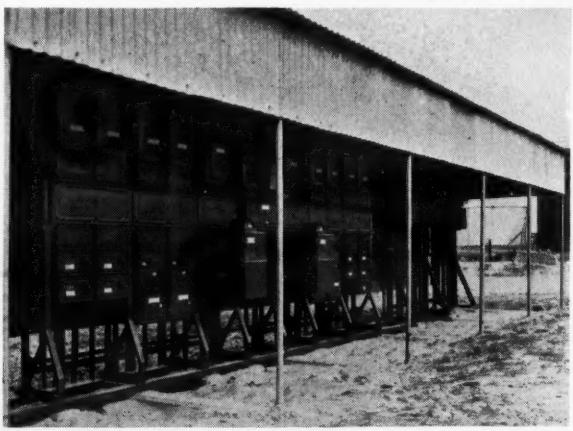
Where cast iron is used the surfaces are sand blasted and zinc sprayed to prevent corrosion, and extensive use is made of aluminium alloy castings. While this necessitates greater attention to earth bonding the reduction in weight assists in quick assembly. At Pernis, for example, a fourteen-panel group motor control board, involving two incoming and twenty outgoing circuits, has been erected in six hours. The normal method of control for each motor starter is by a remote flameproof push-button station with incorporated ammeter in the danger area, the necessary ammeter transformer being housed in the starter enclosure; the associated starter cable box provides a terminal chamber for the main, remote control, and ammeter cables.

The 3 kV IVIO switches made by the Yorkshire Switchgear & Engineering Co., Ltd., for controlling the compressors on the dewaxing plant, have also been developed to operate under the most exacting conditions anywhere in the world either indoors or outdoors.

The duplicate Foster lighting distribution boards, which operate on the 380/220 V, 3-phase, 50 c/s, 4-wire system are arranged back to back as a continuous unit with two 400 A incoming feeders and a 600 A bus-coupler switch. There are ten 100 A outgoing feeders, each with a kWh meter.

A catalytic cracking plant is under construction and a reformer unit is in operation. Here gasoline is treated at high temperature and high pressure, to produce a higher quality spirit. Once again electricity's part is principally concerned with pumping. In the recording and measuring room, as in the caustic treatment plant and elsewhere, Foxboro' temperature recorders are installed. Lubricating oil, refined by the addition of sulphur, separating and filtering, is pumped to the blending department and to the wharf by 20 h.p. pumps controlled by Hazemeyer flameproof push-button stations operating weatherproof starters in the safe area.

Of particular historical interest among the equipment of the decoking plant, the object



Above: Group of motor starters (M. & C.) for doctor treater plant

Left: Section of the 380 V oil circuit breaker board in a transformer station

(1) Electrically driven hot-oil pumps in 3,000 ton a day distillation unit

(2) Electrically driven compressors in de-waxing plant

(3) Pump house providing cooling water at the rate of 40,000 cu m/hr

of which is to clear the tubes of the Dubbs cracking unit from coke deposits, are the 550 h.p. Mather & Platt pumps. Installed here for pumping water, they were originally employed during the last war for the "Pluto" (pipe line under the ocean) scheme.

A big new pump house has just been completed to provide cooling water at the rate of 40,000 cu m/hr. It accommodates four 5,000 cu m/hr and three 2,500 cu m/hr electrically driven pumps, together with two 5,000 cu m/hr steam turbine driven pumps for use if the electricity supply fails. There is also a 220 h.p. fire pump. The main pumps are driven by 1,000 h.p. and 550 h.p. motors. The Brush Electrical Engineering Co., Ltd., was responsible for the switchboards required.

To provide means for pumping oil to Vlaardingen a few miles away a special pump house has been erected at the edge of the refinery area. It is served by a Brush 500 kVA outdoor transformer and is equipped with "Yorkshire" 3 kV switchgear (similar to that used for the dewaxing plant) and Dutch l.v. gear with Ferranti ammeters.

Communication throughout the refinery is facilitated by a Bell 800 line automatic telephone system. Protection against fire is given by a system devised by the Standard Telephones & Cables, Ltd.

We thank the Shell Organization for supplying photographs.

VIEWS on the NEWS

By REFLECTOR

IT is improbable that the reason for and nature of power cuts will ever be understood by a large number of people. A Welsh newspaper says the impression is gaining ground that power cuts are an unnecessary nuisance; that the electricity authorities are purposely imposing the cuts at the most awkward times for householders; and that they are due to "the desire of the electricity bureaucrats to act the autocrat at the expense of the ordinary people." At a British Housewives' League meeting in Leeds one lady complained that "electricity was being given to a tremendous number of factories and mills at the expense of the consumer." A correspondent to an Isle of Wight paper attributes the trouble to the fact that "workers employed on the production side of the electricity undertaking work only five days a week."

* * *

Most of the Electricity Boards have now adopted the practice advocated in the *Electrical Review* of notifying consumers by Press advertisement or leaflets of the days and times at which there is a risk of the supply being cut off. Even so not all consumers appear to be satisfied. One of them, writing to the *Yorkshire Post*, says that the cards issued in his district "bear no relation to the cuts and are, in fact, a considerably less reliable guide than the average race card."

* * *

Some Scots have alleged that their country is being more or less starved of power to meet the rapacious demands of England. Their arguments have been refuted by Sir Norman Duke, chairman of the South East Scotland Electricity Board, who quotes Mr. E. J. Edgar (controller of the S.W. Scotland Division, B.E.A.) as saying that while Scotland's effective generating capacity was at present 758 MW, the estimated demand at winter peak, in severe weather conditions, was 1,030 MW. Towards meeting this deficit the North of Scotland Hydro-Electric Board is said to provide 100 MW. The position seems to have worsened since last winter for the 1949–50 reports of the B.E.A. and Boards show that the maximum output of the stations in the two Scottish Divisions was 860 MW and the combined maximum demand 892 MW.

* * *

I see from *Electrical Merchandising* that experiments are taking place in the United States on the use of infra-red lamps instead of hotplates on electric cookers. The lamp is installed in an aluminium or steel holder about ¼in below the hob which incorporates a top-plate composed of a new heat resisting glass with an operational temperature of 800 deg C, a softening point of 1,500 deg C and exceptional thermal shock resistance. Gold plating is employed in the lamps on account of its high reflectivity and heat resisting qualities, and three sizes of lamps have been tried with loadings of 1,250 W, 1,500 W and 2,100 W. The special glass top-plate is said to absorb over 98 per cent of the light, leaving only a red glow visible. About 60 per cent of the lamp's energy is radiated, the remainder being absorbed by the glass plate and transmitted to the cooking utensil by conduction and convection. It is claimed that the new method, though more costly at present, provides heat more quickly than the conventional methods.

* * *

Reference was made in the *Electrical Review* some time ago to the installation of an electric floor heating system in a new Scottish factory. Now I hear that a similar system is to be employed, as an experiment, in the Health Centre at Sighthill, Edinburgh, and in a new school. This form of heating is very effective and it can also provide a very useful off-peak load as the concrete covering retains the heat for an appreciable time after switching off.

* * *

The following note in *Southern Electricity* (the "house journal" of the Southern Electricity Board) looks like a case of the worm turning :—

> "A certain resident of Slough who was quoted in respect of a new service on September 29th, 1932, has, after eighteen years, one month and ten days, accepted the quotation."

Electrical Conduction

Suggested Uniform Nomenclature

By D. STEWART

IN electrical parlance and publications a conductor surrounded by a non-conductor may be termed a wire, a cable, a core, a line, a lead, a feeder, or a flexible. The bare conductor may be referred to as a wire or conductor, while insulation, insulant and dielectric are the usual names given to the non-conductor. The wire or conductor size may be designated by weight per unit length, diameter, gauge, or cross-sectional area.

Equivocation has been eliminated from the terminology of most electrical methods and it is my purpose now to suggest a simple and uniform terminology for electrical conduction.

Table 1 illustrates the ambiguity of existing nomenclature and it will be observed that, when protection is not provided, a cable is synonymous with an insulated wire or core. In electrical parlance, a small insulated conductor is considered to be a wire and a large one a cable, although there is no definite dividing line. The term "lead" usually applies to a short length of wire or cable.

Wires and cables were manufactured for mechanical purposes long before the advent of commercial electricity. Wires were used for netting, fencing, coiled springs, bird cages, etc., and cables (stranded wires) for haulage and shipping. Although utilizing the existing manufacturing methods, some of the pioneer wire and cable companies were careful to avoid ambiguity in their titles as exemplified in the practice of the London Electric Wire Co. and British Insulated Cables (now London Electric Wire Co. & Smiths, Ltd., and British Insulated Callender's Cables, Ltd.).

Since wire is the raw material for mechanical as well as electrical products, its identity should be changed to "conductor" when it enters the realms of electricity. A conductor coated with a non-conductor (for the purpose of isolating it from other conductors) should be termed an "insulated conductor." This title would also be applicable if an overall mechanical protection were added (see I.E.E. definition of cable).

The word "way" is more appropriate than "core" for separate conducting channels contained under a common protection. The designations multi-core, two-core, three-core, etc., cable could therefore be replaced by multi-way, two-way, three-way, etc., insulated conductor. The latter is an unwieldy designation, but this disadvantage could be remedied as follows.

TABLE 1.—EXISTING DEFINITIONS

Name	Definition	Reference
Wire (insulated)	A solid conductor insulated throughout its length	Chambers's Technical Dictionary
Cable	A length of single insulated conductor (solid or stranded) or two or more such conductors, each provided with its own insulation which are laid up together. The insulated conductors may or may not be provided with an overall mechanical protective covering	I.E.E. Regulations
Core	The conductor with its insulation but not including the protection	I.E.E. Regulations
Line	A commonly used term for denoting an electric power transmission circuit or one of the conductors of that circuit	Chambers's Technical Dictionary
Lead	A term used to denote an electric wire or cable	Chambers's Technical Dictionary
Feeder	An overhead or underground cable of large carrying capacity used in the transmission of electric power	Chambers's Technical Dictionary
Cable Flexible	A cable consisting of one or more cores, each formed of a group of wires, the diameter of the wires and insulating materials being such as to afford flexibility	I.E.E. Regulations

Since the proportion of uninsulated conductors used is very small in comparison with insulated conductors, the word "insulated" could be omitted from the latter and the former prefixed by the word "bare." Abbreviated expressions would therefore be: multi-way, two-way, three-way, etc., conductor.

This system of terminology has the following analogies:—

(1) Underground cabling, where cable ducts are termed: duct (single), multi-way, two-way, three-way, etc., duct.

(2) Telecommunication, where switchboard cords (flexible cables) are termed: cord (single), two-way, three-way, etc., cord.

Line: overhead—bare conductor; underground—conductor.

Lead: short conductor.

Feeder: heavy conductor.

Cable flexible: flexible conductor.

The substitution of the word "conductor" for "wire" and "cable" would, however, have considerable repercussions on electrical nomenclature. The first column of Table 2 indicates some of the ramifications of the words wire and cable with the proposed alternatives in the second column.

TABLE 2.—ALTERNATIVE TERMS

Existing Term	Proposed Alternative
Wire	Bare conductor
Stranded wire	Bare stranded conductor
Cable	Conductor
Multi-core cable	Multi-way conductor
Four-core cable	Four-way conductor
Triple concentric cable	Triple concentric conductor
Coaxial cable	Two-way coaxial conductor
Three wire s. stem	Three conductor system
Wiring of buildings	Electrical conduction in buildings
Wiring diagram	Conductor diagram
Coil wire	Coil conductor
Earth wire	Earth conductor
Wiremen	Electricians
Cable jointers	Conductor jointers

Where wires or cables are used for mechanical purposes they could retain their existing titles of suspension wire or cable, draw wire, binding wire, guard wire, etc.

In general, a cable or insulated conductor has three components—conductor, insulation and protection. To facilitate oral and written expression three names with a similar ending could be used—conductor, insulator and protector. This scheme has an analogy in the radio industry in which the three basic elements are termed resistor, capacitor, and inductor.

Different branches of the electrical industry use different physical characteristics to denote the size of conductor. In telecommunication work line conductors are designated by weight/mile and instrument and exchange conductors by diameter, or gauge. The former is a factor of the "ohm mile constants" and the latter are useful in connection with conductor holes in tags and spatial considerations in cables.

For power distribution purposes sectional area and diameter are important, the first for current carrying capacity considerations and the second for conductor holes in cable sockets, etc. Although the weight of unit length and cross-sectional area have their special uses in designation, lineal measurement is the most comprehensive and so for general purposes diameter seems the best designation.

In commercial correspondence as well as circuit diagrams and technical instructions to installation staffs, conciseness is desirable and in consequence abbreviated descriptions of wires and cables are extensively used. For example, a 37/·093 four-core impregnated paper insulated cable protected with lead sheath, jute, steel tape armour and compounded jute overall is abbreviated to 37/·093 4-core p.i.l.c. s.t.a. cable. This abbreviation does not indicate any paper impregnation or jute protection (although their presence would be generally understood).

If, however, the various insulators and protectors were coded, then abbreviations could be made comprehensive. Suppose, for example, that I1, I2, and I3 represented v.i.r., impregnated paper and dry paper, respectively, and that P1, P2, and P3 represented cotton braid, lead sheath and lead sheath, jute and steel tape armour protections, respectively; then the abbreviation for the cable would become 37/·093 4 W.C.C. I2.P3 (37/·093 4-way copper conductor, etc.). This abbreviation is more comprehensive than the original one and, being shorter, should considerably reduce the labour of printing, typing and writing.

The proposed terminology would remove ambiguity and provide a common and simple language for all engaged in the electrical industry and the public generally. The abbreviations and codings would save time and labour in manuscripts, typing of correspondence and specifications, and the printing of brochures. In unabbreviated literature there would be a disadvantage because wire and cable, words of four and five letters, would be replaced by "conductor," a nine-letter word.

Area Activities

Electricity Boards' Reports for 1949-50

SOUTH WALES

DEALING with the effect of Government restrictions on capital expenditure, the South Wales Electricity Board's report for 1949–50 says the view was taken that little reduction could be made in the Board's programme for new industrial supplies, housing schemes, and reinforcement works. Curtailment of capital expenditure therefore fell mainly on rural development, replacement of obsolescent switchgear and less essential works of system reinforcement, while schemes for voltage standardization and non-operational building work were reduced to the minimum. It is added that if the restrictions continue consumers, particularly in agricultural areas, will have to wait much longer for a supply, and the efficiency of the Board's service to existing consumers will suffer.

The proportion of industrial load in the Area is high (accounting for 78·5 per cent of all electricity sold) and much of it is continuous, resulting in a load spreading programme of a very onerous character. Approximately 30,625 kW of additional capacity was made available to meet the demands of industrial consumers, including 10,500 kW for the National Coal Board. A scheme was introduced for affording a supply to collieries in the Ebbw Vale area from the Board's mains at three points. During the year 137·3 miles of high-voltage and 178·8 miles of low-voltage lines were constructed.

A standard system of street lighting charges was prepared and the observations of the Consultative Council were sought on a proposed domestic block tariff. It was also decided to standardize the charges to the four traction undertakings in the Area.

The total number of consumers at the end of March last was 459,176, an increase of 14,798.

Sales of Electricity and Price per kWh Sold in 1949-50 (1948-49 in italics)

Board	Total Sales		Domestic 2-Part Tariff		Large Power	
	Mill. kWh	Price d	Mill. kWh	Price d	Mill. kWh	Price d
South Wales	2,381·8	0·94	259·3	1·22	1,807·3	0·73
	2,251·6	*0·91*	*238·2*	*1·11*	*1,738·1*	*0·73*
Merseyside and North Wales	2,686·5	1·09	650·7	1·12	1,525·0	0·84
	2,484·7	*1·08*	*605·5*	*1·04*	*1,395·0*	*0·86*
Yorkshire	4,398·0	1·01	1,054·2	1·20	2,623·2	0·78
	4,124·9	*0·98*	*1,025·7*	*1·07*	*2,434·7*	*0·80*

MERSEYSIDE AND NORTH WALES

Besides the urgent demand for providing supplies to the extensive rural parts of the Area, mainly in North Wales, some large industrial projects were commenced in the Merseyside district, which was scheduled as a Development Area during the year. Considerable capital expenditure on engineering works will be necessary, the amount so spent during the year being £2,673,406 (making £5,020,487 in the past two years).

A new point of bulk supply was made available at Chester and others are planned. Of the reinforcement schemes in hand the largest was at Liverpool, where six 33 kV cables were being laid from Clarence Dock power station. Other schemes were being carried out at St. Helens, Warrington, Ellesmere Port and the centre of the Wirral, while in N.W. Wales progress was made with the reconstruction of the 20 kV system for operation at 33 kV, involving 100 miles of overhead line and nine main substations.

The total number of consumers at the end of March last was 683,955, an increase of 22,628. Though the long-term rural plan was further advanced, actual development was confined mainly to industrial supplies and new housing, the latter including sixteen major estates, the largest of which is at Speke, Liverpool, where 3,200 houses are being serviced. Regret is expressed at the restrictions on capital expenditure which must slow down electrical development on which, in the Board's opinion, so much of the future prosperity of the Area depends.

YORKSHIRE

In the Yorkshire Area the year saw a start made on the Board's five-year rural development plan. This originally aimed to provide

electricity supplies to every village by the end of 1954, but some curtailment of the programme will be inevitable under the Government's restrictions on capital expenditure. In implementing the plan some 6,500 wayleaves were negotiated last year, and it is indicative of the public demand for electricity that in no case was it necessary to resort to compulsory powers.

Coal-mining is one of the chief industries in the Area and electrification schemes are so extensive that the National Coal Board asked for an assurance that 25,000 kVA of additional load would be met each year for the next five years. This the Electricity Board undertook to do. Progress was also made with the electrification of mills. Altogether the industrial load increased by 52,000 kW during the year. With 14,400 new houses connected as well as 637 farms and 83 villages, the total number of consumers increased by 35,299 to 1,153,391. It is estimated that in the ten years from vesting date sales of electricity in the Area are likely to be doubled.

A further stage was completed in the general 33 kV system reinforcement in Sheffield and a construction programme was agreed, for completion by the middle of 1951, for reinforcements of supplies in S. and N.W. Leeds. Agreement was reached with certain transformer manufacturers whereby large transformers for major substations would be designed to carry much increased overloads, thus effecting an appreciable saving in capital expenditure.

With regard to charges, the Board decided to investigate the effects of introducing a single domestic tariff of the variable block form.

Mobile Switchgear Showroom

FOR demonstrating typical units from their switchgear range Crompton Parkinson, Ltd., have for several months been operating a mobile showroom that has so far visited most of the industrial centres. The showroom is a special van body on a 5-ton Austin long-wheelbase chassis with 25in Baico extension. The equipment shown includes three complete switchgear units, an oil circuit breaker, and component parts of switchgear such as handle gears and instruments. From the range of high-voltage switchgear there is an ALA metalclad unit representing a type that is available for up to 600 A, 11 kV, and 250 MVA breaking capacity. The oil circuit breaker has side-blast baffle arc-control devices and is equipped with solenoid closing mechanism. To provide for demonstration of the switchgear, the solenoid can be energized from a 30 V Young battery. The ALA unit is fitted with an ASA ring-main isolating oil-switch unit, designed to make on to any fault within the capacity of the ALA oil circuit breaker. Another exhibit is the Klad "A" form of switchgear available for up to 1,200 A, 650 V, 30 MVA breaking capacity.

Interior of Crompton Parkinson mobile showroom

An improved form of T.A.P. oil-immersed automatic fuse type circuit breaker is also shown. This incorporates new types of fuses developed at the Chelmsford Works and tested in the high power station operated by Crompton Parkinson, Ltd. With these new fuses it is now practicable to supply three models of this T.A.P. unit for 100, 150 and 250 MVA breaking capacity respectively. Another typical high-voltage oil circuit breaker is the type TD16 with side-blast baffle arc-control for 800 A, 11 kV, and breaking capacity of 350 MVA. The breaker is fitted with the latest type of spring-close mechanism with the new feature of clock-type springs that provide for a particularly neat and effective design. The instrument exhibit includes the new 6in dial moulded case flush-types for switchboard mounting. The overall dimensions of the van are 25ft long, 7ft 6in wide, and nearly 12ft high.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Yorkshire Electricity Board has appointed **Mr. B. Nuttall**, M.I.E.E., district manager, Halifax, as manager of the Leeds District of the Board. Before nationalization Mr. Nuttall was deputy electrical engineer at Huddersfield, and on vesting date became district manager of the Y.E.B. at Huddersfield. He left Huddersfield a few months ago to take up the appointment of district manager at Halifax.

The Sun Electrical Co., Ltd., announces that **Mr. A. G. Owen** has been appointed as a special director, responsible for the installation accessories side of the company's business. Mr. Owen, who is well known in this branch of the electrical industry, has been with the company since 1906. For many years he was assistant manager of the Installation Accessories Department and since 1945 he has been the manager.

Mr. A. G. Owen

Mr. P. C. Sharp and **Mr. D. S. A. E. Jessop**, directors of the Brush Electrical Engineering Co., Ltd., have now joined the board of Brush Coachwork, Ltd.

At a dinner recently given in Ipswich by the directors of **E. R. & F. Turner, Ltd.**, the guest of honour was Mr. F. M. Minter, B.E.M., who was celebrating his retirement after seventy years' continous service with the company. The guests included thirty-five of his former workmates who have now retired on pension and all those employees who had completed forty years or more with the firm.

Left to right: Messrs. A. H. Leggett (director), A. Leggett (chairman & managing director,) J. E. Wright (director & secretary), F. M. Minter, Ald. C. Catchpole, J.P. (Mayor of Ipswich), and Mr. P. A. Leggett (director)

Mr. Minter, who is eighty-three, worked as a moulder in the foundry and joined the firm in 1880. During the last war, he was singled out for his craftsmanship in the foundry and awarded the B.E.M. During the dinner a presentation was made by the chairman, Mr. A. Leggett, sen., who has himself been with the company for fifty-eight years. The Mayor of Ipswich was present to add a tribute and as a further memento of the occasion, Mr. Minter was presented with a gold medal.

Mr. Ralph J. Cordiner has been appointed president of the American General Electric Co., in succession to **Mr. Charles E. Wilson**, who has been appointed head of the Defence Mobilization Board.—*Reuter.*

On the occasion of the forty-fifth anniversary of **Erskine, Heap & Co., Ltd.**, the directors gave two dinner-dances, one for the staff and the other for the works employees, at the Grand Hotel, Manchester. During both functions, presentations were made of gold watches to each male employee who had had over forty years' continuous service with the firm, together with an initialled combined purse and wallet for his wife. Mrs. Erskine, wife of the chairman and managing director, Mr. R. A. Erskine, made the presentations. After the dinners there were dancing, whist drives and cabaret shows.

The Staff Association of the **Telegraph Construction & Maintenance Co., Ltd.**, held a Christmas social in the pavilion of the Telcon Sports Ground on 15th December, 100 guests attending. Mr. J. P. Hogan, chairman of the entertainments committee, was responsible for organizing a very successful

party which included some original "novelty" dances and prizes. Mr. S. Reed arrived in the guise of Father Christmas and distributed a variety of gifts among the guests. Mr. A. Holdaway was M.C. Mr. F. Leighton, works manager and chairman of the Staff Association, was among those present.

Mr. J. E. Stubbs, B.Sc., A.M.I.E.E., has been appointed assistant sales manager, Switchgear Department, of the Metropolitan-Vickers Electrical Co., Ltd., as from 1st December. After education at Bristol University, followed by a college apprenticeship at Trafford Park, and a period in the switchgear drawing office, Mr. Stubbs spent eight years with the M.-V. agents in Cairo, where he acted as the company's engineer on the North Delta pumping stations contract. In 1939 Mr. Stubbs joined the tendering section of the Switchgear Engineering Department, and in November, 1948, he was appointed assistant to the sales manager of the Switchgear Department. Mr. Stubbs has made many visits abroad, notably to Portugal and Spain in connection with hydro-electric work, and, after the war, to Germany as a member of a B.E.A.M.A. team for the study of German switchgear. He has recently returned from a tour of Australia and New Zealand.

Mr. J. E. Stubbs

Birlec, Ltd., announce the appointment of **Mr. F. Tinker** as their northern area manager with headquarters at Surrey House, Arundel Street, Sheffield, 1. Mr. Tinker joins Birlec from their associated company, Henry Wiggin & Co., Ltd.

Mr. R. J. Lewis has been appointed a director of Kerry's (Great Britain), Ltd.

Last week we had the pleasure of listening to the first concert to be given by the **London Electricity Music Society** (a central section of L.E.S.S.A.). The concert was notable for a number of reasons. There were five conductors, Messrs. L. Atkins, D. Sharpe, F. Stevens, J. Steele and K. Thomas, each of whom kept admirable control of the orchestra and choir. The principal orchestral work was Schubert's Unfinished Symphony. This work is not so fashionable these days, but it still remains one of the great symphonies and Mr. L. Atkins, who conducted, and the orchestra, gave a polished performance. Other favourite orchestral pieces included the overture to "The Marriage of Figaro" (conducted by Mr. Atkins), Handel's "Water Music" suite, the overture to "Egmont," and Elgar's "Pomp and Circumstance, No. 4" (conducted by Mr. K. Thomas). The vocal items included part-songs by Elgar and Edward German, conducted by Mr. D. Sharpe, three carols and Beethoven's "Hallelujah unto God's Almighty Son" (conducted by Mr. F. Stevens), and carols, in which the audience were able to take part, conducted by Mr. J. Steele, who also wound up an admirable programme with the ever popular "Hallelujah Chorus" from "The Messiah."

From 11th to 16th December at Magnet House, Kingsway, the talents of the Dramatic and Musical Societies of the **General Electric Co., Ltd.,** were combined to present a sparkling revue for the Festive Season entitled, "The Christmas Show 1950." The ambitious programme included a fine performance of the "Hallelujah Chorus" by the G.E.C. singers, "Les Sylphes," a burlesque on ballet, "Le Rêve," a commendable collection of operatic arias, "Pantomime Visit," a skit admirably performed by William Peacock and Michael Molloy on the difficulties of an American visitor seeing a pantomime for the first time, and "More Opera" in which the G.E.C. Dramatic Society effectively mimed the quartet from "Rigoletto." William Peacock devised and produced the show and some of the skits. The musical director was J. Morgan Wilson.

Mr. F. J. Erroll, M.A., A.M.I.E.E., who is M.P. for Altrincham and Sale, was married on 19th December to Miss Elizabeth Sowton Barrow at St. Paul's Church, Knightsbridge.

Mr. and Mrs. F. J. Erroll leaving the church after the marriage ceremony

As our readers know, Mr. Erroll is a regular commentator on Parliamentary affairs in the *Electrical Review*; one of his "Industry and the House" articles appears in this issue.

The annual dance of the **Benjamin Social & Athletic Club** took place at the Regal, Edmonton, on 15th December, when 300 employees and their friends attended. A cabaret and exhibition dances were given during the evening.

OBITUARY

Dr. E. Mallett.—The death occurred on 10th December at the age of sixty-two of Dr. Edward Mallett, D.Sc., M.I.E.E., principal of Woolwich Polytechnic. Dr. Mallett was educated at Southend High School and University College, London, and was awarded the David Hughes Scholarship of the I.E.E. and the Ellen Watson Memorial Prize in applied mathematics. He was apprenticed to Crompton & Co., Chelmsford, and went as assistant engineer (Post Office) to Glasgow. Before the 1914-18 war he was engaged on transmission work, and during the war he served in the 52nd and 74th Divisional Signal Companies in Egypt and Palestine; in the last year of the war he was in the Research Department of Woolwich Arsenal. After the 1914-18 war Dr. Mallett returned to the Post Office where he became interested in the application of the thermionic valve to telephony; later he was engaged in designing and selling paper-making machinery. Following this he began teaching and for twelve years was assistant professor at the City and Guilds (Engineering) College. He was appointed principal of the Woolwich Polytechnic in 1932. Dr. Mallett was chairman of the Wireless Section of the I.E.E. in 1936-37.

Mr. David Somers Brown, a former director of the Parsons Marine Steam Turbine Co., Ltd., Wallsend, has died at the age of seventy-three. He retired in 1949 through ill-health. Mr. Brown was a vice-president of the North-East Coast Institution of Engineers and Shipbuilders and a member of the Institution of Naval Architects and the Institute of Marine Engineers. He joined the Parsons Co. in 1902 and became a director in 1936.

Mr. F. F. Robinson.—The death occurred on 17th December at Holmbush Road, S.W.15, of Mr. Frederick Foley Robinson, M.I.E.E. Mr. Robinson, who was eighty-six, was for some years in the electrical branch of the L.C.C. Chief Engineer's Department.

Mr. Peter Ormiston, A.M.I.E.E., chief generation engineer (operations), in the East Midlands Division of the British Electricity Authority, died at his home at Bramcote, Notts, on 16th December at the age of sixty-three. Mr. Ormiston joined the Derbyshire and Notts Electric Power Co. as a mains engineer in 1913 and later became chief engineer of the Midland Counties Electric Supply Co. At vesting day he took up his position in the East Midlands Division. He leaves a widow and two married daughters.

Mr. P. Good.—A memorial service for Mr. Percy Good was held on 18th December at St. Martin-in-the-Fields, the Rev. L. M. Charles-Edwards officiating, assisted by the Rev. C. Cresswell. An address was given by Mr. R. Duncalfe (chairman of the British Standards Institution). Representatives from many branches of the engineering and electrical industries attended, among them being Sir William J. Larke (past president, B.S.I.), Sir Archibald Gill (president, I.E.E.), Sir John Hacking (deputy chairman (operations) B.E.A.), Sir Harry Railing (chairman and joint managing director, G.E.C.), Mr. L. Gamage (vice-chairman and joint managing director, G.E.C.), Sir Noel Ashbridge (Director of Technical Services, B.B.C.), and Sir Arthur Fleming (director of research and education, Metropolitan-Vickers Electrical Co., Ltd.).

Students' Vacation Training

THE sixteenth annual report on the vacation work scheme to enable students of the Imperial College (London University) to obtain industrial experience is a record of continuing achievement. During the 1950 summer vacation 515 Imperial College students had in toto nearly 2,000 weeks' experience with British firms and, including students from other universities, 2,500 weeks' experience with firms in eleven countries abroad. Their total earnings during that period amounted to more than £20,000.

Rolls Royce, Ltd., and Lever Bros. & Unilever, Ltd., have continued their financial assistance to the broadening of the organisation to include students of other Universities. The Dunlop Rubber Co., Ltd., is providing nine travelling bursaries in 1951 (three British and six foreign) to assist necessitous students. They will be administered by the I.A.E.S.T.E. organisation (see *Electrical Review*, 1st December) which has similar objects and for which the Imperial College Union acts as a clearing house.

Overseas Electrical Trade

WITH an increase of more than a quarter of a million pounds over the October total, the value of exports of electrical equipment last month, at £12,308,883, was only £79,790 below August's record figure. Shipments of goods and apparatus amounted to £7,749,494 compared with £6,244,727 in November last year, while corresponding totals for electrical machinery were £4,061,981 and £3,399,123. Our usual analysis of the figures will be given next week.

Electricity Generation

Outline of Existing Practice

METHODS of generating electricity were outlined in a lecture illustrated with lantern slides which Mr. Harold J. Beard delivered last week to the Association of Supervising Electrical Engineers. Mr. Beard pointed out that although the coal consumed by the electricity supply industry had increased nearly four times in the last twenty-five years, the increase in total consumption had been only 2 per cent. Thus increasing use of electricity was in the national interest because it conserved coal reserves. The largest consumption of electricity per year per head of the population was in those countries which had large water power resources. The maximum size of water turbines was dependent upon workshop facilities, available means of transportation to installation site and ease of maintenance in service.

There was over 600,000 kW of pumped storage hydro-electric plant in Europe and a small amount in the United States. In this country there was 150 kW of pumped storage plant at Walkerburn on the River Tweed and the North of Scotland Hydro-Electric Board was installing a 5,000 kW pumped storage scheme at Sron Mor.

Other Power Sources

The use of gas turbines in this country was likely to be limited to special duties. The B.E.A. was to install two experimental wind power sets, each of 100 kW, on one of the Orkney islands and at Mynydd Anelog in North Wales. Diesel generating sets in this country were mostly below 1,000 kW at from 300 to 1,500 r.p.m.; 34 per cent was their maximum efficiency. Atomic power did not involve any new thermo-dynamic principles, but the practical difficulties were formidable. It was very doubtful whether the exploitation of tidal power could ever be justified economically.

Since 97 per cent of the electricity output of this country was generated by the use of coal, Mr. Beard devoted the second half of his lecture to steam power stations. Their siting was becoming increasingly difficult from the points of view of cheapening delivery of fuel, adequacy of cooling water and disposal of ash. Acceptance of the "unit" arrangement of plant made steam reheating again popular, thus improving the thermal cycle by from 4·5 to 5 per cent; over 20 per cent of new plant in the United States was being arranged for reheating. While some engineers preferred the strict "unit" arrangement (for greater simplicity) there was a good deal of preference for limited interconnection on the feed water side only, to reduce the stand-by pump capacity; or on the feed as well as steam sides, to enable one of two "units" to be operated in the event of the other going out of commission. It was doubtful whether there was very much difference between the capital costs of the two schemes.

Outdoor Stations

Outdoor stations were being built in the United States to reduce capital cost. In some the boilers only were external; in others both boilers and turbines were outside, with protection for the operating staff. A number of such plants had functioned satisfactorily through sleet storms, heavy rains and hurricanes. The B.E.A. was building a semi-outdoor station to contain two 60 MW sets, at Ince in Cheshire.

The "vortex" type of turbine blading improved efficiency, but complicated manufacture; such twisted blades were mostly limited to the larger last rows of the low pressure cylinder.

After illustrating trends in boiler design Mr. Beard concluded by exhibiting diagrams of the main electrical connections of a power station and of the grid system.

Broadcasting Committee

THE Broadcasting Committee of 1949, under the chairmanship of Lord Beveridge, held its last meeting on 15th December. Its report will be presented to the Government with accompanying documents immediately all these can be printed.

Manufacturers' Activities—I

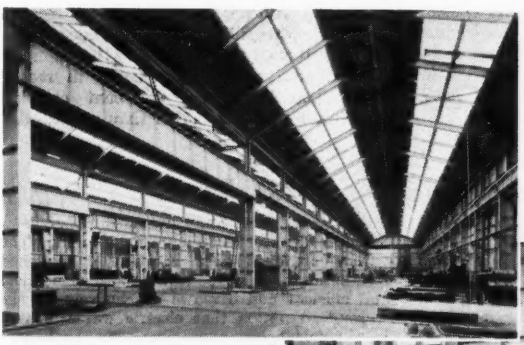
Parsons' Home and Export Orders

STEAM turbo-alternators ordered during 1950 from C. A. Parsons & Co., Ltd., were mainly for export. Canada ordered 5, 7·5, 15, 30 and 100 MW sets, South Africa 20, 40 and 60 MW sets, Southern Rhodesia one of 4 MW, Australia 5, 6, 30 and 50 MW sets and Mexico 15 MW machines. Home orders for 3 MW and 12·5 MW pass-out sets were for a board mill, a paper mill and a steel works. Erection on site has been, or is, proceeding of two 50 MW and one 30 MW sets in Australia, two 30 MW and one 50 MW sets in India, six 60 MW sets (with hydrogen cooled alternators) and six of 50 MW at home.

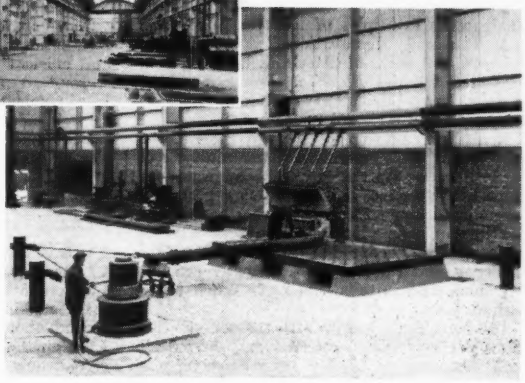
In India, a 50 MW and two 30 MW sets and a 2·5 MW house set were completed at the Cossipore power station and a 4 MW set at the Benares station. In South Africa, a 12·5 MW set was commissioned at Port Elizabeth and a third 1·2 MW set at Windhoek. In Australia, a fourth 30 MW set was commissioned at the Newport "C" station and a 15 MW set at Brisbane, and 15 MW sets have been completed in Canada, Mexico and Iraq.

The second 31·5 MW set went into service at the Ballylumford power station in Northern Ireland and at home a second 50 MW set was completed at the Dunston "B" station, together with machines of 978 kW, 1·5 and 6·5 MW for chemical works and paper mills.

The erection is proceeding in the company's shops of the 15 MW gas turbo-alternator for the Dunston "A" station and of a 10 MW machine for the National Gas Turbine Establishment. The company is manufacturing a new gas turbine of some 2·5 MW net output to a design which it considers will be looked upon as basic for the future. It embraces all the information gained at the works and elsewhere after five years of research, rendering it particularly suitable for erection abroad where the cost of handling large components and of making extensive



Part view of new three-bay sho at Heaton works for making steam boiler pipes



First pipe being bent in October last

foundations can sometimes be prohibitive. Orders for transformers and reactors came from Australia, Canada, Gibraltar, Malaya, the Middle East, South Africa, South America and Spain. They vary in size from 10 kVA up to 75 MVA, for voltages up to 138 kV. Orders for distribution transformers continue to increase; large contracts include a total of 78 between 10 and 750 kVA for the South East Scotland Electricity Board; 37 for the North of Scotland Hydro-Electric Board; 43 for the North Western Electricity Board; 260 for export to Australia; 27 for Malaya; and 14 for Gibraltar.

An order was completed during the year for fifteen 100 kVA three-phase, 50 c/s, 6,300–3,150/220 V transformers for an oil refinery in Sumatra. They are hermetically sealed, the off-circuit tappings and the alternative primary voltage being selected by externally operated switches. Among the large transformers ordered are eight of 45 MVA for 132/33 kV, each fitted with on-load voltage regulating equipment for the B.E.A. and one of 75 MVA at 11/35·4 kV for the Brimsdown power station. For export to Spain there are two of 25 MVA at 128·4/70/11 kV.

Orders for oil-immersed, naturally cooled, magnetically shielded reactors included one for 32 for operation on an 11 kV system in Abadan; nine for a 33 kV system in Australia; and two for over 600 A on a 6,600 V system in Venezuela.

The optical works are busy with 74in reflecting telescopes for Australia, Egypt and France, while the 98in diameter mirror for the proposed Isaac Newton telescope will not only be the largest ever undertaken by Parsons', but also the largest ever worked outside the United States. The 5 ton disc cast in 1936 by the Corning Glass Co., of New York, for the MacGregor Trust of Michigan, was presented by that body to the Astronomer Royal during his visit to America in 1949. When completed, the telescope is to be erected at Hurstmonceux Castle, Sussex, where the Royal Observatory is now situated.

The final assembly of the photo-zenith tube for the Royal Observatory has been practically completed and a similar instrument is to be made for the Cantonal Observatory, Neuchâtel, Switzerland. The number of infra-red spectrometers now in service exceeds 30; new laboratories will be ready early in 1951. For the aluminizing of mirrors for television receivers a new vacuum evaporation plant has been installed by the company to step up the production rate.

At the urgent request of the British Electricity Authority new shops at Heaton South covering 100,000 sq ft of floor space, with a two-storey block to house the engineering division, have been erected in record time. The first pipe was bent on 2nd October, four weeks earlier than scheduled.

DOMESTIC WATER HEATING

A FULLY illustrated 263 page book entitled "Domestic Water Heating: Basic Engineering Principles of Electric, Solid Fuel and Gas-fired Installations," by Ronald Grierson, M.I.E.E., M.I.Mech.E., has just been published for the *Electrical Review* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 25s (postage 5d).

Apart from setting out the principles of the subject this book presents a critical analysis of current practice in the supply of hot water for domestic purposes. The increasing cost and enormous demand for new housing have made the time opportune for such an investigation for it is generally conceded that the standard efficiency and running costs of many present-day household installations leave much to be desired.

The book deals mainly with the combination of an electric immersion heater and thermostat with a conventional hot water storage tank in conjunction with a coal- or coke-fired domestic water heater, this being arranged either as a "back-boiler" or as an independent unit. The author contends that a suitably arranged installation of this type can be both economical and efficient and disposes conclusively of the widespread notion that electric water heating is convenient but expensive. The book contains in addition considerable reference to the factory-made, self-contained, storage type of electric water heater.

Manufacture in N.E. England

SPEAKING at the fifteenth ordinary general meeting of North Eastern Trading Estates, Ltd., on 15th December, the chairman said that firms making electrical equipment now employed about 18 per cent of the total labour force on the estates; with 2,000 men this was second only to the plant, machinery and tools group as a male-employing industry.

Pumped Water Storage

The Herdecke Station in the Ruhr

By T. C. GILBERT, M.I.E.E.

EDITORIAL comment on this subject may revive interest in some of the storage power plants in the Ruhr, especially the largest of these plants, Herdecke, on Lake Hengsty on the River Ruhr, the topographical and technical details of which have some slight basis of comparison with the Loch Sloy project, mentioned in the comment in your 24th November issue.

In order to appreciate fully the significance of the Herdecke storage station, it should be noted that the problem of seasonal adjustments in the supply of electricity in North-West Germany, with its rich bituminous coal and lignite deposits, is not as difficult as in the case of a purely hydro-electric supply, which demands the provision and development of large-scale annual storage capacity in order that the rains of the wet season may be conserved for later use. In the Ruhr, the coal supply is available in any desired quantity at any time, so the main problem was not the overcoming of seasonal variation, but rather that of dealing with the shorter interval peak loads.

By adopting the principle of accumulating water in an elevated reservoir by means of pumps operated by increasing the night output of the steam stations, peak loads are dealt with in a rationally satisfactory manner. The aim is to balance, as far as possible, the output of the steam stations by an increase at night and a reduction during the day. In this connection the daily load curve of the Herdecke storage station (Fig. 1) is interesting. The capacity of 560,000 kWh, which is at the disposal of the station every morning, not only guarantees a supply to the network, but represents an instantaneous reserve and is available at the times required.

The topographical conditions of the hill summit at Herdecke enable the upper reservoir to cover some 18½ acres, with a storage capacity of about 350 million gallons; the variation in water level from empty to full is 65 ft, and the operating head of water is between 475 and 540ft, compared with

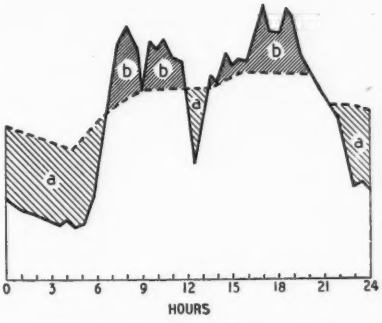
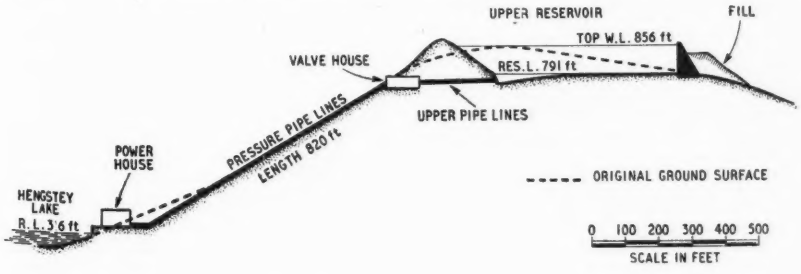


Fig. 1.—Typical load curve showing effect of power storage: (a) pumping; (b) generating
(Dotted line shows output of steam station)

Fig. 2.—Cross section through Herdecke system



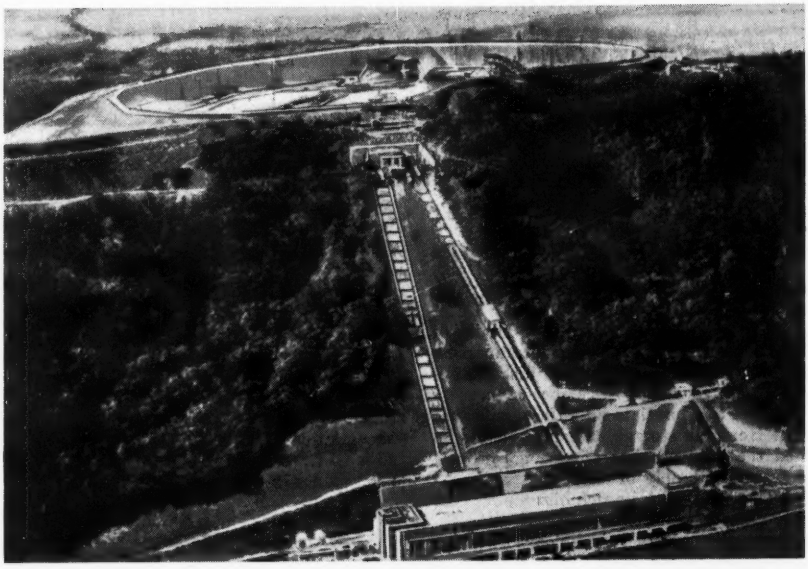


Fig. 3.—Herdecke power storage plant under construction, 1928

910ft at Loch Sloy. For pumping, a maximum of 2,100 cusecs is provided—four pumps of 525 cusecs, three of which can fill the upper reservoir in 10 hours, the power required being approximately 105,000 h.p. The turbines have a total capacity of 3,640 cusecs (four of 910 cusecs each). When fully loaded they generate 194,000 h.p., or approximately 140,000 kW, as compared with the 130,000 kW with four sets at Loch Sloy. This whole output may be compressed into four and a quarter hours.

Each machine has an axial length of 85 ft, consisting of a spiral Francis turbine with free shaft, synchronous three-phase generator (for generator or motor operation) and a twin two-stage pump; the operating speed is 300 r.p.m., compared with the Francis-type turbines at Loch Sloy which operate at 428 r.p.m. The Herdecke station can be switched automatically from pumping to generating in two minutes; during pumping periods the turbine discharges are closed by means of flaps. Each power unit is provided with a main pressure pipeline, the lower branch of which, leading to the pump and turbine, can be closed by means of a 5ft 9in diameter emergency valve. The valve house is situated at the upper anchorage point of the pipeline and the hand-operated and automatic throttle valves are controlled from this point. The length of pipeline is 820ft from the valve house (Fig. 2) at the very favourable grade of 57 per cent; this compares with 1,500ft of the Loch Sloy pipeline, with pipes of 7ft diameter.

The diameter of the Herdecke pipes is 8ft 4in and the maximum water velocity, with turbine in operation, is 16½ ft/sec. At the valve house, each pair of pipes joins to form a single 16ft 5in diameter pipe, which leads back on a grade of 1 to 13½ to a trumpet-shaped cutting in the reservoir floor, at a point 31 ft below the general floor level. The construction of the upper reservoir, some 790ft above sea level, necessitated the excavation of nearly 1½ million cubic yards of rock. On the east side, where the pipelines are situated, the reservoir is bounded by a sloping concrete-lined rock face, whereas the other longitudinal side is formed by gravity walls, having a maximum height of 70ft and running back to meet a rock slope. All concrete surfaces are rendered impermeable by a double bitumen spray treatment.

In the construction of the plant more than 435,000 cubic yards of concrete was placed—the dam alone at Loch Sloy required some

200,000 cubic yards—and approximately 1¾ million cubic yards of earth and rock excavation was necessary. It is interesting to note that the main tunnel at Loch Sloy required the removal, mainly by blasting, of 180,000 tons of rock and the surge chamber over 2,400 tons. Work commenced on Loch Sloy in May, 1945, and the station was opened for partial working in October, 1950; the Herdecke station was started in September, 1927, and brought into operation in December, 1929.

There are some fifteen major power storage stations in the Ruhr district, some combining storage with continuous operation, and they contribute to the relief of high peak demands to a marked degree. Their characteristic feature of employing the surplus output of thermal stations to pump water to elevated reservoirs has proved of considerable value in meeting peak demands, to the extent, in fact, that some power storage stations have been constructed to work on a fixed water volume, with even the local lakes of semi-artificial construction. With these, the cycle of operations, pumping and generating, recurs indefinitely with the relief of peak demand cycles, and practically every small lake or water conservation point on the Ruhr River contributes its quota.

Electrical Production in Israel

Plans for Expansion

By **H. REIK**, M.Sc. (Eng.), A.M.I.E.E., A.M.I.Mech.E.

SINCE the State of Israel was established in 1948 its Jewish population has grown by over 65 per cent to 1,250,000. Israel's production, though from 35 to 40 per cent above the 1947 level, has not been able to keep up with its increase of population thus creating a sellers' market which has encouraged the development of industry. This development is tied up with an efficient supply of electricity by the two supply companies, the Israel Electric Corporation (formerly the Palestine Electric Corporation) and the Jerusalem Electric Corporation. The Jerusalem power station still employs diesel generators and has a comparatively small capacity, but the Israel Electric has two modern power houses in Haifa and Tel Aviv. A 30 MVA turbo-generator was recently installed in Haifa, with a second unit to be installed early next year which will bring the Haifa capacity to about 100 MVA. High-pressure boilers and turbo-generators of latest design, working at 1,250 lb/sq in, are to be installed at Tel Aviv which will treble the capacity and make the plant the most advanced in the Middle East.

Some of the larger industrial concerns like the large Haifa oil refineries, the Nesher cement works and others have their own power supplies adding 15–20 MVA to the country's generating capacity.

Outlying agricultural settlements generate their own electricity, using American or British diesel sets, until they can be connected to the grid, when these sets will be kept for standby purposes.

Motor Manufacture

There is a considerable demand for small industrial motors and a factory for the production of squirrel cage motors up to 25 h.p. is being laid out at a new industrial centre at Ramle (due east of Tel Aviv on the way to Jerusalem). Motors are already being made up to 10 h.p. as standard; special units were manufactured during the war, the largest being a 400 h.p. vertical motor.

All medium and heavy electrical equipment has to be imported, the only exception being transformers which are now made up to 500 kVA locally thus satisfying the requirements for smaller distribution centres. These are being made by "ELKO" of Tel Aviv who also make variable voltage transformers, instrument transformers, welding plant, starters and other equipment. This firm is now transferring its activities to a modern single-storey building of about five times the present floor space, specially laid out for its production.

This concern is perhaps typical of Israel's

industry which had to grow from very small beginnings against world competition, as there were no protective tariffs. This limited them to the manufacture of special equipment to suit local conditions and forced them to produce single units or very small batches. Israeli industrialists are fully aware of these drawbacks and many firms which by necessity grew rather haphazardly have now acquired new sites where they are developing well-planned workshops and factories. They are also trying to limit the range of products made by one firm so as to enable them to run reasonable batches and reduce labour and overhead costs.

Starting gear, measuring instruments, relays, time switches, switchboards and all kinds of domestic equipment and fittings are made by other factories. The writer visited the "Ekonomik" works at Nahlat Ganim near Tel Aviv. This is a nicely laid out and self-contained production unit. It has its own metal shop for pressing, drawing, bending and welding work and a finishing shop doing galvanizing, spraying and electroplating. The electrical section makes immersion heaters, kettle elements and special heaters. It also produces a range of water heaters, tea kettles and sterilizers which, whilst being more expensive than comparative British makes, are of good quality and extremely competitive in Israel.

High Costs

The high prices are mainly caused by the high cost of living and the correspondingly high rates of labour. It can generally be said that prices in Israel are 200–250 per cent, wages 150–200 per cent and salaries about 150–175 per cent above those in Great Britain.

Another problem is the scarcity of skilled labour and technicians; most of the immigrants are unskilled. Electrical engineering is being taught at the Hebrew Technical College at Haifa and numerous trade schools give courses for electricians and some technical schools teach up to the Ordinary National Certificate (approximately) while laying greater stress on practical work. Courses in radio engineering have been started recently. The Institution of Engineers and Architects, which includes all electrical engineers, co-operates with the Government, the manufacturers' association and the Histadruth (the Israel Trades Union Congress) in solving the problems created by this scarcity of technically-trained men.

Increased production per man-hour is to be achieved by the import of first-class equipment suited to local requirements in so far as the availability of foreign currency permits. Production engineers are advising on incentive schemes which are now to be applied in every branch of industry, while mechanical handling equipment is being partly imported and partly produced locally. The aim is to double Israel's 1947 production by 1952 and to treble it by 1955 thus satisfying the home market and leaving a surplus for export.

Many products which are still being imported are to be manufactured in Israel. A recent example is electric lamps, which are now being made at the rate of 2,000,000 per annum by the OR-ES concern in Haifa while Philips of Holland are also going into production soon. Radio sets are now assembled locally and it is hoped to limit imports to valves and speakers in the not-too-distant future. Refrigerators will also be assembled locally.

There has been co-operation between British manufacturers and Israeli firms in some directions. A typical case is that of the Israel Electric Wire Company, Haifa, which is now doubling its capacity with the aid of British cable manufacturers who are supplying modern equipment for this purpose. This will enable the company to supply all the v.i.r. cable required locally with a surplus for export.

The Government has passed a law to facilitate capital investment by foreign investors. This reduces income tax rates, allows transfers in the investor's currency out of annual profits and gives additional benefits. An Anglo-Israel Chamber of Commerce has recently been set up which will give further information to anyone interested.

Irish Electrical Production

REPLYING to questions on rural electrification recently Mr. Cosgrave, Parliamentary Secretary, Ministry of Industry and Commerce, said that the Electricity Supply Board found it difficult to obtain supplies of transformers, insulators, galvanized steel wire and ironwork and certain sizes of wood poles. The Board had actually exceeded its responsibility in endeavouring to get the material made in Ireland. The factory that had been established could not quote prices comparable with those of imported equipment although the Board conceded a preference of 10 per cent and even higher.

Industry and the House

Raw Material Position

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

AFFAIRS in the House of Commons during the month of December have been dominated by international events culminating in the visit of the Prime Minister to the United States. It was known that he would deal with the growing shortages of raw materials amongst many other items during his visit. Nevertheless, on his return he made but passing reference to the subject, either in his statement to the House on 12th December or during his speech on opening the foreign affairs debate on 14th December.

Information about a rapidly changing situation has been made available piecemeal. The Minister of Supply has been questioned each Monday ,during December about different shortages. M.P.s have felt a growing uneasiness at the reports they have been receiving from firms in their constituencies. The Minister had let it be known that he would shortly be making a statement, and everyone was surprised when this took the form of a written answer to a question put down on a day which was not the Minister's usual day for answering questions. By this means the Minister, no doubt unintentionally, was able to avoid a barrage of supplementary questions and on the following Monday only one or two questions were on the Order Paper which could lead to supplementaries about raw material shortages.

Proposed Restrictions

The Minister's statement announced that the Government had decided to take further steps to ensure proper distribution of metals where a severe shortage existed. The steps to be taken in regard to individual metals were then outlined. Zinc supplies would be further cut and an allocation system introduced. Copper supplies would have to be cut by about 10 per cent. Aluminium supplies would be restricted in 1951 to 15,000 tons a month from 17,000 tons a month during 1950. The Minister concluded by stating that there was no real shortage of steel although there might be difficulties in obtaining supplies of steel-making raw materials.

The subject was thoroughly explored during the first of the Christmas adjournment debates by Mr. Summers, who was able to demonstrate to the House the growing apprehension of manufacturers. Members on both sides of the House reminded the Minister of the consequences of the shortage of raw material supplies and the effect it would have on rearmament and export orders, quite apart from possibly creating unemployment.

Bulk Purchasing

The Junior Minister, Mr. Freeman, replied for the Government. He made the point that the Government had in no way been complacent and he challenged the House to state any course of action " which we could have followed that would have given us a more reasonable chance of obtaining more supplies of these materials than the actions which we have carried out without their suggestions." Once a shortage had appeared, he said in effect, no Government could have done more. But critics point out that the most severe shortages were occurring in those raw materials which the Government bulk purchases and that one of the advantages claimed for such a method was that it would eliminate the very shortages which had in fact arisen.

Mr. Freeman went on to deal with certain specific commodities. The most serious shortage was that of zinc supplies. There would be a very serious shortage for at least the first two quarters of 1951 and an allocation system would be introduced, which would, however, be a matter of great complexity. Negotiations with the Aluminium Company of Canada had been successfully concluded and, in advance of a full statement, he could say that sufficient supplies had been secured to meet the defence and essential civilian requirements for 1951. As regards raw cotton, the position was critical but there was no need for Members to entertain exaggerated fears. The Minister also appealed to

all users to refrain from placing duplicate orders for scarce commodities.

On 12th December the House turned its attention to another critical shortage, namely that of coal. Debates on coal have been conducted in a bitter party manner for too long now for the Commons to be able to adopt a judicial frame of mind on this subject. The country has had four years of nationalization and, according to the Opposition, the National Coal Board should have proved itself. Supplies of coal should be more abundant and man-power for the pits ought to be on the increase instead of dwindling with such alarming rapidity. According to the Minister, Mr. Noel-Baker, the Coal Board had had well-nigh insuperable difficulties to overcome. There was a fine spirit in the industry and a will to succeed. He could not entertain the request of the Opposition for an outside inquiry into the industry which would only have the effect of diverting the members of the Board and their senior executives from the vital and urgent task of increasing the production of coal.

Immediately following this debate was a pleasant little knock-about occasion when Mr. Nabarro, the Conservative M.P. for Kidderminster, raised the question of the advertising policy of the British Electricity Authority. He was able to point out some real weaknesses in the Authority's advertising and he complained that Members of Parliament should be denied information about the cost of the campaign. The Junior Minister, who was frequently interrupted, maintained that advertising policy was an administrative matter for the Authority itself to decide.

Such a short debate inevitably left the bigger issues untouched. How far should prestige advertising by a monopoly be permitted since the cost can be so readily repaid by increased charges to consumers? How far are advertising agents influenced by the value of such large accounts when considering advertising programmes for private firms?

Surge Divertor Design

I.E.E. Supply Section Paper

THERE are two methods by which electrical equipment may be protected from voltage surges. In the first, a large part of the energy of the surge is rapidly absorbed in a capacitor or inductor, stored until the surge has passed, and then released into the circuit at a rate which allows it to be safely dissipated. In the second method a shunt path is provided through which most of the surge current is diverted so that it does not flow in the apparatus to be protected. Surge modifiers operate according to the first method and surge divertors to the second.

The design of surge divertors each consisting of one or more enclosed spark-gaps in series with a column of non-linear resistors is dealt with in a paper prepared by Mr. T. F. Monahan (Metropolitan-Vickers) which was read at a Supply Section meeting of the Institution of Electrical Engineers in London last week. The factors which affect the sparkover voltage of the gaps and their ability to interrupt follow-current are illustrated in this paper by consideration of a wide variety of designs of gaps of different complexities.

The various methods of distributing the voltage between a number of series-connected gaps are considered, after which characteristics of silicon-carbide non-linear resistors are discussed and some observations are subsequently made on the mechanism of sparkover and puncture at large surge currents.

The author classifies surge divertors as rural, line or station type according to the surge current which they will safely carry, and gives performance figures and curves for each of the three types. With regard to the testing of the ability of a divertor to interrupt follow-current he suggests that suitable currents are 1,500 A for the rural type, 5,000 A for the line type and 10,000 A for the station type. This test, however, cannot be made on complete divertors of the higher voltage ratings but if suitable precautions are taken it is satisfactory to test them in sections.

In conclusion Mr. Monahan expresses the opinion that future developments are likely to include increased non-linearity of the resistance material, resulting in improved protection and increased surge current capacity of the resistors.

A street equipped with the new system of lighting, the fluorescent tubes being mounted in lanterns attached to the face of the buildings

New Idea in Street Lighting

Fluorescent Lamps Fixed to the Face of Buildings

By B. C. OSSITT *

THE placing of lamp columns and kindred street "furniture" presents a serious problem to local authorities in general and to street lighting engineers in particular. The erection of a column on a footpath already too narrow to permit more than a limited flow of pedestrians and perambulators only causes greater congestion, whilst the multiplicity of various services under the ground too often precludes the placing of the column in the best site, and devious methods have been employed to get reasonably safe foundations for such columns.

Wall brackets supporting street lamps do not appeal to everyone; span wires across the street have many disadvantages; and everyone is familiar with the archaic monstrosities of cast iron columns topped by elaborate ornamental iron work, costing so much in time and money to maintain. Even with the modern trend towards slim and streamlined columns, it would be more advantageous in narrow built-up streets to provide a street lighting installation without columns, wall brackets or span wires.

With this end in view the writer had the idea of using 5ft fluorescent lamps in suitable lanterns fixed to the face of buildings, the light source being placed parallel to the street.

Mr. N. Boydell, M.I.E.E., manager, East Sussex and South West Kent Sub-Area of the South Eastern Electricity Board and a past-president of the Association of Public Lighting Engineers, made available every facility for the carrying out of an experimental installation.

The Revo Electric Co., Ltd., made up prototype lanterns for use in the initial tests, which were carried out in the works yard of the Sub-Area at Eastbourne. By mounting the lanterns on the platform of the tower wagon it was found that the best and most even distribution of light occurred when the height was between 23ft and 25ft. Photometer readings taken on a line 15ft in front of the light source at intervals of 3ft in either direction gave readings of 2·1 ft-candles opposite the lamp down to 0·05 ft-candle at a distance of 51ft (see Curve A, page 1112).

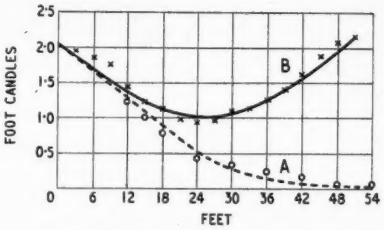
A second lantern was then mounted at a height of 25ft on an existing column and the lamp on the tower wagon was lined up at 30ft distance between the light sources, the

* Lighting engineer, East Sussex and S.W. Kent Sub-Area, South Eastern Electricity Board

position thus being one of permanent street lamps in "opposite formation." The tower wagon was then moved to a different position to give conditions of "staggered formation," and it was ascertained by individual observation over a period that there was good and even visibility, with the light sources in "staggered formation" at a spacing of 52ft. Photometer readings gave a diversity of 2·31 to 1 (Curve B).

These results proved that such an installation would be an economic proposition, and South Street, Eastbourne, a shopping street, was selected for the trial installation. This street has a total length of 670ft, the carriageway averaging 30ft and the footpaths 7ft. Along 460ft of this street nine lanterns were mounted on the buildings, temporary services being obtained from two existing street lamps. On the installation being made permanent, one underground service on each side of the street only will supply the lanterns, which will be interconnected by surface wiring.

The lanterns in position are almost unnoticeable by daylight. The result by night



Photometer readings taken during the tests

exceeded all expectations, the street being flooded with a soft light, quite free from glare and shadows. The illumination is especially pleasing to drivers on wet nights when visibility is not impaired by reflected glare from the road surface. The total minimum average light output from the nine lanterns is 20,520 lumens; this, with a lantern efficiency of 75 per cent, gives 4,450 lumens per 100ft linear of roadway. Capital and annual maintenance costs are expected to compare favourably with those of other known methods.

TELEVISION PLANS

EVEN allowing for rearmament it is expected that the programme for completing five high-power television transmitters will be completed by the middle of 1952 and will thus make reception possible for 78 per cent of the population of this country. By 1954, when five more low-power stations would be in service, 85 per cent of the population would be covered. Making this announcement, Sir William Haley, Director General of the British Broadcasting Corporation, said that we should then have a greater coverage than any other country in the world.

The Holme Moss station (35 kW) for the 11 millions in the North of England is now complete to the roof and 600ft of its 750ft mast has been erected: the completion date is mid-1951. The 50 kW transmitters at Kirk o'Shotts (Central Scotland) and Bristol Channel (Wales and West of England), each providing a service for 3½ million people, are due for completion at the end of 1951 and mid-1952 respectively. The programme for putting into service the five 5 kW stations is as follows: 1952, Newcastle and Southampton; 1953, Belfast and Aberdeen: 1954, Plymouth.

It is proposed to spend over 60 per cent of the Corporation's available capital on television during the next three years, the approximate estimated total expenditure (revenue and capital) on the service being: 1950–51, £2,700,000; 1951–52, £3,500,000; 1952–53, £4,000,000. Orders valued at £750,000 have been placed for three experimental colour television channels.

Misuse of I.E.E. Initials

REFERENCE is made from time to time to the watchfulness of the Council of the Institution of Electrical Engineers in preventing the misuse of designations of membership. During the last three years action taken in thirty-three cases of this kind has been satisfactorily concluded without recourse to the Law Courts. One recent case, however, had to be taken to the High Court of Justice. Mr. Justice Romer ordered the defendant, Ralph Matthew Emmerson, to be restrained from using in connection with his business of an electrical contractor or engineer the initials M.I.E.E. or any other designation implying (contrary to the fact) that he was a member or otherwise connected with the Institution. Defendant was ordered to pay the plaintiffs' costs.

Commerce and Industry

Training Technical Teachers

Improved Method of Testing Steam Turbines

NEW arrangements for the training of teachers of technical subjects have been announced by the Ministry of Education. Under the Emergency Training Scheme, which is now ending, a beginning was made in providing full-time training for experienced personnel from industry wishing to teach in technical colleges and similar institutions, including secondary technical schools. Three colleges, in London, Huddersfield and Bolton, which have been in use for this purpose hitherto, are to be continued as part of the permanent training arrangements. These colleges will in future be maintained by the local education authorities.

Courses, normally of one year's duration, will be open to persons not under 25 years of age who already possess appropriate qualifications and practical experience. The college authorities will be responsible for the selection of the students. Tuition will be free and there will also be free board and lodging or a day maintenance allowance for non-residential students, subject to a contribution from the student in accordance with his financial circumstances. Students may also qualify for additional grants, including a personal allowance, vacation allowance and dependants' allowance where appropriate.

One of the "Skylift Giants"

New vacuum impregnating plant installed at the Austin Walters factory

Extended Transformer Range

Simultaneously with the development of their small power and neon sign transformers Austin Walters & Son, Ltd., Manchester, have extended their range of transformers from 100 kVA capacity up to 600 kVA. New equipment installed for this purpose includes a self-contained vacuum impregnating plant manufactured in their own factory and capable of handling their largest coils.

Giant Industrial Trucks

What are believed to be the largest industrial electric trucks in use in this country have been ordered from the United States for the great new Abbey Works (near Port Talbot) of the Steel Company of Wales, now nearing completion. Their routine task will be the moving of large quantities of sheet steel but at present two out of the five are being employed in the constructional work.

These "Skylift Giants" were designed by the Automatic Transportation Co., Chicago. Each has a four-wheel front drive assembly consisting of twin motor units driving the two pairs of wheels. Each unit operates through fully enclosed helical bevel and spur gear reduction, wh ich is immediately accessible for maintenance purposes. A high degree of

manœuvrability is provided by a full differential between the four driving wheels and the axles of the two units are pivoted to give complete compensation for roadway obstructions. A high-pressure hydraulic lift system operates through a multi-action three-cylinder ram pushing directly against the cantilever, eliminating chains, sprockets, etc.

The batteries for these trucks were produced by Chloride Batteries, Ltd., and are the largest ever manufactured in this country for an industrial truck. They consist of 36 Exide-Ironclad 1,500 Ah cells. Each of the two units is fitted with lifting lugs so that the batteries can be exchanged in a few minutes.

In addition to these five 30,000 lb capacity trucks five 15,000 lb trucks will be placed in service at the Tinplate Works, Llanelly. All this equipment has been supplied by Lansing, Bagnall, Ltd., Basingstoke, who represent the Automatic Transportation Co. in this country.

Iron and Steel Prices

A new Order amending maximum prices for a limited range of iron and steel products, the principal of which is terneplate, has been made by the Minister of Supply. The Order, the Iron and Steel Prices (No. 5) Order, 1950, came into operation on 14th December. Copies are available from H.M. Stationery Office or through any bookseller.

Aluminium Supplies

Arrangements have now been made by the Ministry of Supply with the Aluminium Company of Canada, Ltd., for the supply to the United Kingdom in 1951 of 50,000 metric tons of virgin aluminium in addition to the 150,000 metric tons already contracted for and for the supply in 1952 and 1953 of 220,000 metric tons per annum. The Government has agreed to fund afresh over a period of twenty years the loans made to the company during the war to finance the expansion of capacity in Canada and to make a new loan to the company of 25 million dollars towards the financing of further expansion. The company will give the United Kingdom a first call on 200,000 metric tons per annum of its production for twenty years.

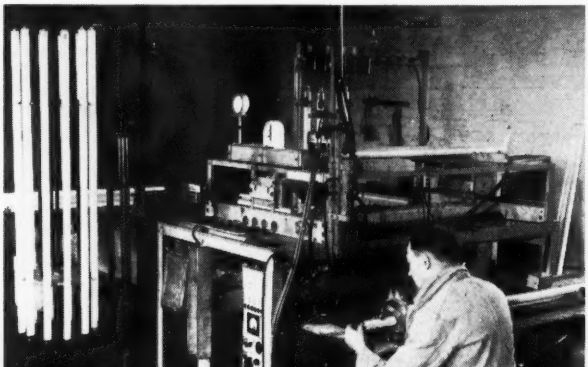
Reinstatement in Civil Employment

The Reinstatement in Civil Employment Act received the Royal Assent on 15th December. It confers rights of reinstatement in former employment, corresponding to those in the National Service Act, 1948, on members of the reserve and auxiliary forces called out or recalled for whole-time service at any time after 15th July, 1950 (this includes reservists recalled for Korea); national service men who between 15th July and 1st October, 1950, voluntarily undertook up to six months' additional service; men who voluntarily undertook a period of whole-time service with a view to service in Korea; and certain other persons who serve whole-time in H.M. Forces or the women's services.

Reconditioning Fluorescent Lamps

An experimental plant for the reconditioning of fluorescent tubes has been built by Messrs. E. J. Dawes (proprietor: Mr. F. W. Cottrell), Erimus Works, Stockton Street, Middlesbrough. Employing three operators, it is capable of dealing with 500 tubes a week; larger units with much greater capacity are planned.

At present only 5ft 80 W tubes are dealt with. Tubes which have failed as a result of the cathode filaments losing their emissive qualities can normally be reconditioned, those showing the characteristic starting glow at the ends being generally suitable. About 75 per cent of these pass safely through the reprocessing operation. Life after reprocessing is claimed to be similar to that of new lamps, the efficiency at the usual test point (after 100 hours' use) being about 90% of that of new lamps.



Experimental plant for reconditioning fluorescent lamps

Reconditioning consists of repeating the processes through which the lamps pass in initial manufacture. Before this can be done, however, the caps have first to be removed. The sealing ends are then carefully broken to admit air slowly so as to prevent the inrush of air blowing off the fluorescent coating inside the tubes. With the aid of a gas jet, holes are made in the ends of the tubes opposite the filaments, which are then treated with a solution to restore their emissive qualities. After the holes and the stem have been resealed, the process continues as for new lamps.

Steam Turbine Tests

The testing of steam turbines and associated plant requires the accurate measurement of steam pressure and water flow together with that of steam and water temperature. The most numerous measurements taken are those of temperature and these are of vital importance in the interpretation of test results. Hitherto temperature measurements have depended mainly on mercury-in-glass thermometers, but owing to the difficulties and inaccuracies involved in their application to this particular problem the Metropolitan-Vickers Electrical Co., Ltd., has developed a technique employing thermocouples that makes possible measurements at a central point of the temperatures at the various check positions throughout the plant under test.

Apart from the saving of possibly six observers the advantages of this system are speed of response, elimination of stem corrections and errors due to unknown temperature gradients, and avoidance of the self-heat problems experienced with resistance thermometers. Differential measurements can be made more simply, thermocouples are easily fitted and the equipment is slightly simpler than that available for resistance thermometers, the cost of manufacture being also slightly lower.

Lack of Materials

Probably the concerns which are most affected by the present scarcity of materials are the small and what are called " small-medium " firms ; they are certainly the greatest sufferers from the high prices of these materials, stocks of which are very costly to finance. The situation was discussed at a luncheon-meeting last week of the North London Group of the Engineering Industries Association, when a number of members spoke of the serious harm which the shortage of materials and the difficulty of financing stocks was doing to the smaller engineering industries.

Particular complaint was made of members' inability to fulfil export delivery promises and it was suggested that for dollar markets, at least, greater consideration should be given by the Government to the manufacturers' needs.

The meeting was presided over by Mr. P. H. Davies, Group chairman. The principal guest was Mr. Ernest A. J. Davies, Parliamentary Under-Secretary of State for Foreign Affairs, who addressed the meeting and was thanked by Mr. A. N. D. Kerr.

Copper Industry Investigation

The President of the Board of Trade has announced that the Monopolies and Restrictive Practices Commission has been asked to inquire into practices in the supply of certain semi-manufactures of copper and copper alloys.

The Millionth Motor

The millionth Brook industrial electric motor manufactured since the establishment of the firm in 1904 was presented to the chairman and founder, Mr. Ernest Brook, J.P., on 16th December on behalf of the directors, staff and employees by Mr. John Habron, who has had 34 years with the firm. The motor will remain as a permanent exhibit and is housed in a special display cabinet from which it drives a pneumatic tube system.

Employees, their families and friends were entertained during the afternoon. There was a fun fair with roundabouts, swings, etc., and 400 entries were received for an arts, crafts and hobbies competition. Various sections of the works were transformed into palaces of entertainment and many diversions were arranged. Every employee received a gift from the directors and special commemorative medals were obtainable straight from the press.

Women's Wage Increase

Following the increase in wages awarded to male workers in the engineering industry higher rates have been fixed for women employees. The minimum time rate for women over 21 is raised from 66s 6d to 75s and those now earning more than the minimum will receive 79s 1d. The minimum piecework rate for employees of average ability will be 80s, instead of 70s 7d.

Import Licensing Control Changes

Parts of hand tools and bench tools may now be imported without individual licence from the usual " liberalization " list of countries. Present arrangements for licence-free imports of lighting appliances and fittings will now be restricted to those which do not contain pottery with applied decoration, or cut, engraved, etched, or gold enamelled glassware.

Tramcars for Blackpool

An order was recently placed by Blackpool Corporation for twenty-five new single-deck tramcars. They will be built by Charles Roberts & Co., Ltd., and will be similar in many respects to the modern " Vambac " cars which were

introduced at Blackpool after the war. For the new vehicles, however, the bodies have been re-designed and improved and increased in size. With a length of 50ft and a width of 8ft they will have seating for 56 passengers. The tare weight is approximately 18½ tons. Each car will have two Maley & Taunton HS.44 bogies with M & T air brakes and magnetic track brakes. Each bogie carries two Cardan shaft drive C.92 motors, driving through spiral bevel gears, to axles with rubber sandwich resilient wheels. The electric traction equipment, which is supplied by Crompton Parkinson, Ltd., includes control gear of the "Vambac" variable multi-notch type with 91 steps for acceleration and rheostatic braking.

Wages Award Protest

As a protest against the recent wages award n the engineering industry, about 10,000 employees of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, decided last week to cease piecework and go on to day rates. It appears that their dissatisfaction was due to the reduction of the "differential" provisions existing between pieceworkers' and timeworkers' rates. They said that as they were already being paid in excess of the new piecework rates they derived no benefit.

The *Manchester Guardian* reported last week that 6,000 pieceworkers at Ferranti's Hollinwood and Moston factories decided to discontinue piecework and overtime on 31st December. Employees of other concerns were expected to be involved, but the movement was not expected to be general. For instance, the employees of Lancashire Dynamo and Crypto, Ltd., decided to continue piecework upon the new terms.

Electrolytic Copper Prices

The Ministry of Supply announces that as from 1st January its selling prices for imported Canadian and American electrolytic copper in special shapes and to special specifications will be subject to increased additions per ton to the basic price of copper. Additions chargeable will range from £1 17s 6d to £13 2s 6d according to category.

Llandarcy Refinery

The Electrical Apparatus Co., Ltd., draws our attention to the fact that it supplied flameproof starter boards controlling important processes at the Llandarcy Oil Refinery described in our issue of 15th December. It was actually one of this company's boards illustrated on page 968. Incidentally the words "motors" and "meters" were transposed in the captions of the two illustrations on that page.

Trade Announcement

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester, have appointed Mr. H. S. Jenkins as representative in South West England and South Wales.

Nationalized Industries

A SERIES of twelve studies of nationalized industry is being produced by the Acton Society Trust (Acton House, Church Road, Claygate, Surrey). The first, which has just appeared, is entitled "Accountability to Parliament." It is considered that Parliamentary control, which it was thought would be a safeguard to the public, has proved unsatisfactory: first, because information available to Parliament is inadequate and delayed; and secondly because Members, in general, are unable to assess the highly technical points involved. Moreover there has been a tendency to concentrate on minor management questions rather than broad policy.

The paper sets out to state the methods available to ensure public accountability. It is shown that Parliament can proceed by way of Members' questions to the appropriate Ministers; by debate in which the Ministers answer for the industries concerned; and by the appointment of Select Committees to inquire into and report upon the activities of public corporations. Limitations imposed upon the scope of questions are examined. It is interesting to see in an appendix giving an analysis that so far as the British Electricity Authority was concerned, from 1947 up to October last 132 questions were permitted and only eight were refused.

Six methods of initiating debates are set out but the conclusions are reached that too little time is afforded and that the debates occur too long after the periods to which they relate. Ministers' responsibilities are examined and the rôle of the Public Accounts Committee is dealt with.

In the conclusions reference is made to the proposed seven-year reviews of nationalized industries—possibly to be conducted by a Select Committee. One alternative is to transfer some of the burden to a body other than Parliament: this might be on the lines of the Transport Tribunal; independent supervisory bodies similar to the now extinct Electricity Commission; or an economic or industrial "Parliament."

Finally it is asked whether the public corporation is a satisfactory form of ownership, and this is to form the subject of a later study.

The papers can be obtained from the Trust at 2s a copy or at 21s for the series.

ELECTRICAL CONTRACTING: Organization and Routine

By H. R. TAUNTON, A.M.I.E.E.

20.—*Invoices and Time-Sheets*

APART from expenditure on standing charges the disbursements of a contracting firm are represented by time-sheets (labour), invoices (material) and certain petty cash vouchers—the paper basis of the profit-earning activities of the business. The accountant may not be able to deal with incoming invoices at once and until he can they (and credit notes) can be kept in a box file labelled "Invoices—Check." The first operation on them is checking for reference to order number, agreement with advice note, prices and discounts, and arithmetic—extensions and totals.

Errors and Omissions

If the order number reference is missing, it must be ascertained and filled in. The omission may be on the part of the supplier; but it may be that a verbal or informal order has never been properly confirmed. The matter should be investigated promptly and, if necessary, an order written to rectify any omission. The wording of the invoice should be checked next, from the advice note. This may not be available and then the original order must be used for checking. The advice note is obviously better for the purpose, as it shows what has actually been supplied, which may be, for one reason or another, different from what was ordered. Any such differences should be noted and referred to the person responsible for the original order. Nine-tenths of the invoices will be for small amounts and for familiar supplies; and a junior with a little experience can safely be left to check them, and their arithmetic, a purely mechanical matter. As for the remaining tenth, the accountant should make a rule that invoices for any amount above a certain figure, say £3, should be left to him to check for prices.

No invoice must be passed for payment until it has been fully checked and agreed on all these points. A rubber stamp should be impressed on each invoice. A suitable one would have spaces for the job number or name and for the cost ledger and bought day book references; and provision for ticks against O(rder number), Q(uantities), P(rices), and A(rithmetic), as each is checked.

The checked invoices should be kept in another box file, labelled "Invoices—Book," until they can be booked to the appropriate cost ledger accounts, work usually left to the junior. They can then be placed in a third box file, labelled "Invoices—Enter," until the accountant is free to deal with them. This should have an alphabetical index to allow the invoices to be grouped together for convenience of entering to the various ledger accounts.

Among them will be a certain number, for stationery, plant, office maintenance, etc., which cannot be booked to any contract. They represent overheads, and will in due course be journalized accordingly. They will be checked in the same way as "material" invoices, but will then pass direct from the "Invoices—Check" file to the "Invoices—Enter" file.

A fourth box file completes the series needed for the preliminary handling of invoices before they are finished with. This can be labelled "Invoices—Hold." In it should be kept any invoices that for one reason or another are not to be booked or entered at once in the cost ledger or bought day book: invoices on which there is a query or some correction to be made perhaps. Here, too, should be kept invoices for outstanding packing and debit notes awaiting the appropriate credit note from the supplier. It is not necessary to make any distinction in their preliminary handling between credit notes and invoices.

Filing Booked Invoices

The invoices once entered in the bought day book, a matter of ordinary bookkeeping, are finished with altogether. It is assumed they have first been booked to the cost ledger, the usual procedure, as it is important that the cost ledger should be as nearly

up-to-the-minute as possible. They should now be bound permanently. Arch files, with alphabetical guides, as used for ordinary correspondence, provide as convenient a system as any ; and in them they can remain until they become obsolete and can be packed away.

Form of Time-Sheets

Time-sheets have the same importance in relation to labour as invoices to material, and they should be in a form full but clear, to assist quick and accurate handling. A foolscap size is desirable, to give plenty of room for particulars and calculations. Following the obvious heading and a line for the man's name and the date of the working week, the body of the time-sheet, however it may be arranged, should provide, for each working day, a space for the day-sheet number, further particulars when necessary, expenses, time of starting and stopping work, and total hours for the day. Space should be provided for the addition of country money and for the totalling of the hours and expenses columns ; and finally for the foreman's signature and the initials of the checker.

A stringent rule should be made that the body of the time-sheet must be made out by the man himself : never, in any circumstances, by the foreman. He should sign all sheets before sending them to the office to guarantee their general correctness. Time-sheets, however, should not be passed for payment until they have been checked again at the office, either by one person—e.g., the supervisor—who is given the responsibility of it, or by the engineer interested in the particular job. Calculations of overtime are sometimes erratic, and he may have to query excessive hours, or expenses booked without explanation.

The foot of the time-sheet, or the back of it, should carry short printed instructions, and should state the time in the week by which sheets must be received at the office, usually first post on Friday morning. Friday is the most convenient pay-day, as it gives the men their money in time for their wives to do their weekly shopping in comfort, and it leaves the accountant free on the short Saturday for any work that may be urgent. Time-sheets must be checked first thing in the morning, so that the accountant may begin his work on them at once, set out in the wages analysis book. Much of the detail will have been written in it the previous day so that no time will be wasted before making out the wages cheque and getting it signed and cashed as soon as possible after the bank opens.

The wages analysis book can be a book with stock rulings, easily obtained from stationers, with the necessary number of columns, and its use is a matter of ordinary book-keeping. Four cash columns in it should be reserved for analysis : " productive " wages and expenses, and " unproductive " wages and expenses.

The wages book just described differs little from that of any trading firm, and its analysis is confined to the requirements of ordinary book-keeping. A contractor, however, has to analyse his wages for " productive " labour on other lines, and in greater detail, having in mind the working of his costs system. This special analysis can be carried out in another book which, for him, is more truly the wages analysis book : let us call it the " labour analysis book." It is possible to dispense with a book entirely and use the time-sheets themselves for the analysis. An advantage, apart from the saving of stationery, is that it is then unnecessary to rewrite dates, men's names, and rates. The system, with obvious adjustments, can be adapted to the labour analysis book.

Provision for Analysis

The back of the time-sheets should be printed to provide a suitable form, arranged to occupy about two-fifths of the whole at the bottom, and to be read at right angles to the form on the front of the sheet. The form, headed " Analysis," should have a space for a distinguishing number, the same as that noted against the man's name in the wages analysis book for the current week, followed by an initial to indicate his grade. It will be ruled with a wide column headed " Name of Job," a narrow one " Hours," and two cash columns headed " Wages " and " Expenses " respectively.

The first column will be filled in with the names (preferably) or day-sheet numbers of all the jobs to which the man has booked time during the week. The filling-in of the other columns is obvious. Time on any non-productive work should be kept distinct from the productive work by entering it at the end with its separate total. The sum of the four totals (wages and expenses) must tally with that of the amounts shown in the

" Gross Wages " and " Expenses " columns of the wages analysis book. They are then transferred to the four analysis columns of that book and the folio reference noted.

The next thing is to collect the figures ascertained for each man under the names of the various jobs or day-sheet numbers. To post them direct to the various accounts in the cost ledger would be wasteful of its space. It is better to collect them on loose sheets which can presently be bound up with the time-sheets : of the same size but of somewhat stouter paper and preferably tinted.

The printing on these sheets should only occupy about four-fifths of its length, leaving the rest free for convenience of binding. Headed " Summary of Labour Costs—week ending . . ." they should be ruled with a narrow column, " Men," two cash columns, " Wages " and " Expenses," a " Folio " column, and two more cash columns, " Total Wages " and " Total Expenses." In the width available—about 10in—this ruling can be repeated ; one sheet, therefore, will serve for a fair number of jobs.

Under the name of the job or the day-sheet number written across the first three columns the number and grade initial of each man will be entered in the " Men " column and against it his wages and expenses as shown on his time-sheet analysis form.

When all entries for the job are so made, the two cash columns are ruled off and their totals extended in the two " total " columns. The sum of those columns should tally to a penny with the totals of the " productive " wages and expenses columns in the wages analysis book.

" Unproductive " Expenses

The items of " unproductive " wages and expenses on the time-sheet analyses need not be summarized in the same way. They will be relatively few, and can be posted direct through the journal to the appropriate accounts. It only remains to enter the totals shown against each job on the summary sheets to the corresponding accounts in the cost ledger, noting the reference in the folio column. Time-sheets, analyses, and summary are then finished with.

Time-sheets, with attached summary sheets, may be either clipped together in weekly batches and kept in some suitable receptacle or, better, bound together in book form, when they become practically a permanent labour costs analysis book. A strong suitable binding, can be easily " home-made " with a couple of stout millboards cut larger all round than the size of the sheets. The front cover should be hinged by cutting it across, about 2in from the " spine " edge and rejoining the two parts with a leather or stout canvas strip, glued, both covers being bored to coincide with holes punched in the sheets.

Petty Cash

The routine of the petty cash book is a matter of ordinary book-keeping, but we are here interested in it in so far as it affects the keeping of the cost ledger. Petty cash expenditure on jobs is either in the form of expenses or of small cash purchases. The bulk of the expenses are those shown on the men's time-sheets, and their disposal is provided for by the system just described. It will often happen, however, that a foreman has to buy petty material from some local shop, and in the ordinary course he will enter his expenditure with his expenses on his time-sheet, and attach vouchers. The easy way is to deal with the whole as expenses, but it has the slight disadvantage that it will subsequently be all entered in the cost ledger in the " Expenses " column instead of in one of the " Material " columns ; but the amounts are usually so trifling that it would be rather splitting hairs to trouble to allocate them precisely.

On large country jobs, however, the amount involved may become too large for its special character to be ignored without misleading results in any subsequent costs analysis, so we must in some way arrange that these costable cash purchases do not pass through the time-sheet system at all, but are dealt with through the petty cash. Where the contract is large enough to justify the foreman having an imprest petty cash account, the desired result is attained automatically. In other cases, however, he buys petty material and enters it on his time-sheet ; and if the amounts are more than trifling, he will attach vouchers for the various items. It is a simple matter then to extract them from his time-sheet and pass them through the petty cash book, to be dealt with there. A petty cash docket, quoting the foreman's name and the name or number of the job, should be made out for the total of the vouchers, pinned to it, and the necessary petty cash added to that in the foreman's pay envelope, shown as due to him in the wages analysis book. The pay envelope should be endorsed accordingly.

Besides the cash purchases accounted for by men on the jobs, there will be a certain amount of petty cash expenditure by the office staff to be booked to the cost ledger: travelling expenses, for instance, and occasional small cash purchases. All these must be covered by dockets or vouchers. Suitably-printed dockets for petty cash can be bought in pads from stationers, and should be used wherever a voucher is not available.

In due course all vouchers and dockets are entered in the petty cash book. Those chargeable against a cost ledger account (as indicated by their endorsement) must be entered in two columns, separate from all other petty cash payments, and headed "C.L. expenses" and "Cash purchases." The costing clerk will then post the amounts shown therein to the various costs accounts, noting the folio reference.

Load Shedding

A SPECIAL review of the position regarding the heavier and more extensive load shedding that has taken place during September, October and November compared with the corresponding period of 1949 is given in a report prepared by the Electricity Sub-committee of the National Joint Advisory Council (chairman: Sir Robert Gould). The Sub-committee finds that the heavy load shedding has been the result of a number of factors. First there has been a very large increase in the consumption of electricity, which is reflected in the higher demand at peak periods, the average daily peak figure during the period concerned being about 1,200 MW greater than in the corresponding period of last year.

The weather too was considerably colder. Furthermore, the percentage of the British Electricity Authority's total generating capacity which was out of service during these months was substantially higher than had been anticipated, the main cause being the increased incidence of breakdown of plant (300–400 MW more). Although the B.E.A. is making every effort to expedite repairs, it is not possible to guarantee that the amount of plant available during January and February will be up to present estimates.

The Sub-committee feels keenly that industry is still bearing the main burden of load spreading and if further sacrifices are to be called for, it is essential that there should be a much more drastic approach to the commercial and domestic consumer. The Sub-committee believes that the general public is not yet alive to the serious threat to national production, to employment and earnings and even to the physical safety of large numbers of workers, which is involved in continuing load shedding, and it recommends that there should be a forceful and aggressive publicity campaign utilizing the Press, posters, films and broadcasting to bring home these facts.

Although further load spreading by industry would not completely eliminate power cuts, the Sub-committee believes that increased efforts in this direction would reduce the amount of shedding and it recommends that Regional Boards of Industry should appeal to industry and commerce to put into operation wherever practicable the load spreading measures which were in force last winter, with the object of securing a reduction in the peak load of about 20 per cent. The greatest possible use should be made of auxiliary plant.

The Sub-committee does not recommend general resumption of Saturday morning work with a compensating half-day off during the week as a measure to spread the industrial load and considers that in most cases further load spreading measures on the five normal working days would give more effective results. Full support is given to suggestions for broadcasting more detailed economy warnings by the B.B.C. and for warning industrial consumers of impending power cuts by means of short-wave radio transmissions by the electricity authorities: application has been made for Post Office sanction to the use of such an experimental transmitter in the Yorkshire area. It is also recommended that consideration should be given to extending the period of prohibition of display lighting to an hour later than 6 p.m. so that, if industry chooses to work after that time, there would be a greater assurance of adequate power supplies in the evening.

As it is clear that the deficit in electricity supply will continue for a long time, even on the most favourable assumption for the next four years and possibly longer, the Sub-committee recommends that the possibility of the B.E.A.'s discriminating to a greater extent than is done at present between different types of consumer should be looked at afresh.

N.S.W. Buys American Plant

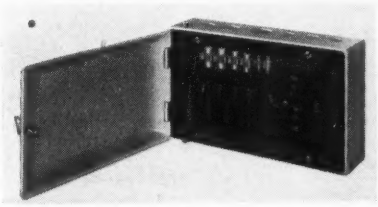
AS a matter of urgency the New South Wales Government has been granted $6 million for the purchase of generating plant from the United States. Reporting this, the Sydney correspondent of *The Times* says that 37 MW of plant is involved and the first unit will be shipped from America in February or early March.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Domestic Control Units

AN attractive range of domestic consumers' control units has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. Each unit contains



G.E.C. domestic control unit

a 60 A double-pole all-insulated rotary switch and a bank of 4, 5 or 6 single-pole fuses with a neutral bar. The fuse carriers are designed to take high breaking capacity cartridge fuses and clips are provided inside the case for spares. The case is of pressed steel with a die-cast cover and is finished in cream. The capacity and number of the fuseways is varied in four ways to meet the requirements of different installations and provision is made for ring main and tree systems of wiring.

Instrument Sterilizer

A small unit for the sterilization of surgical instruments, etc., known as the "Surqualatic" sterilizer, is the only upright electrical instrument sterilizer on the market totally encased in a heat resistant plastic jacket, which allows it to be safely handled when in use.

The instruments are held vertically and separately to protect cutting edges and facilitate extraction after sterilization. The tray is hooked underneath the lid, which is stepped so that condensation falls back into the container. The sterilizer is deep enough to accommodate small bottles, etc., and is fitted with a cut-out which switches off the current when it boils dry. A pilot light indicates when the sterilizer is working. It is designed for operation on 100/110 V or 200/250 V a.c. mains and is manufactured by SURGICAL EQUIPMENT SUPPLIES, LTD., Westfields Road, Acton, London, W.3.

Domestic Accessories

An attractively designed ceiling switch offered by ASHLEY ACCESSORIES, LTD., Ulverstone, Lancs, is primarily intended for a.c. circuits rated up to 5 A but is equally efficient on d.c. up to 2 A. With fixing centres of 2in and an overall diameter of 3¼in the switch is suitable for mounting on to a B.S. round conduit box or direct to the ceiling without a wooden box. It is made in one- and two-way types, in either white or brown moulded material.

The same company has also introduced a surface mounting 3-pin 13 A shuttered socket outlet and fused plug to B.S. 1363.

Water Boiler

The "Derby" automatic water boiler produced by JAMES STOTT & CO. (ENGINEERS), LTD., Oldham, has a reserve of 4½ gall of boiling water always available and a recovery capacity of 6/7 gall of boiling water per hour, the heating element being automatically brought into operation when 2 gall has been drawn off from the reserve. The electricity supply is automatically cut off should the water supply fail. The total loading is 3½ kW but the maintenance consumption is only 250 W.

The boiler is particularly suitable for use in

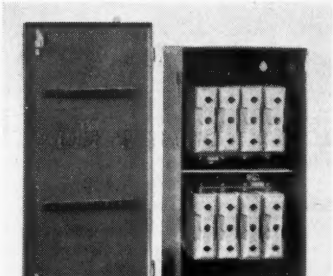
Stott "Derby" boiler and below: "Surqualatic" surgical instrument sterilizer

small refreshment rooms, canteens, snack bars, all-night cafés, hospital ward pantries, accident wards, rest rooms, etc., where boiling water is required instantly at widely varying times and long intervals.

Distribution Fuseboards

A new range of steel-cased distribution fuseboards in 30 A, 60 A and 100 A sizes for circuits up to 500 V has been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The boards are neat and attractive in appearance, finished in grey enamel, and are arranged to provide convenient wiring space combined with good accessibility. Special locking and padlocking fastenings are provided and cable entry can be made from both top and bottom.

All sizes of boards are available in double-pole, triple-pole and triple-pole-and-neutral types and in the 30 A size there is a range of single-pole-and-neutral boards. The 30 A range is available in 2-, 4-, 6-, 8-, 10- and 12-way forms and the 60 A and 100 A in 2-, 4-, 6- and 8-way. In every case the boards can be supplied with rewireable fuse carriers or with carriers to accommodate h.r.c. cartridge fuses.

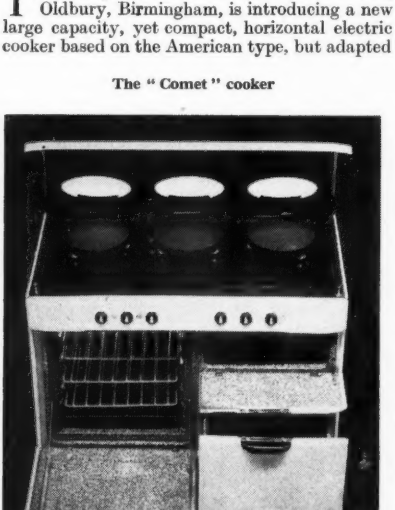


Typical G.E.C. steel-cased distribution fuseboard

Horizontal Large-Capacity Cooker

THE Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham, is introducing a new large capacity, yet compact, horizontal electric cooker based on the American type, but adapted to British taste and needs. Called the "Creda Comet," it will be produced in a series designated DH. 1–2 (home models) and DH. 3–4 (export models) and will be available in the home market early in 1951.

The "Comet" cooker



Measuring 36in by 36in by 21in, the cooker has an oven half as large again as those in most vertical type cookers. An automatic interior light is fitted in the oven which has a drop-down, spring counterbalanced door. The grill chamber is spacious and the separately heated warming drawer has a pilot light indicator. A horizontal panel in front of the cooker provides "finger-tip" control. Models DH. 1 and 3 rest on two solid legs, while DH. 2 and 4 have a storage cabinet base. All models are designed for the minimum of day-to-day attention.

The difference between the home and export models is in the arrangement of the hob. DH. 1–2 have three 8in "Simmerstat" controlled, solid or radiant type boiling plates to E.D.A. interchangeability. DH. 3–4 have an additional 6½in solid or radiant boiling plate: all the boiling plates are controlled by "Simmerstats" but are not to E.D.A. interchangeability specification.

For standard cream enamelled finish and for voltage ranges of 200/210, 220, 230/240 and 250 a.c., the prices are:—DH. 1, 54 gns; DH. 2, 60 gns; DH. 3, 56 gns; and DH. 4, 62 gns. Models for other voltages and with an all-white finish cost a little more.

Progress in Brazil

From a Correspondent

THE Brazilian Government's programme to increase installed generating plant capacity made good progress during 1950. The Brazilian Electrical Enterprises, a subsidiary of the American & Foreign Power Co., completed two new hydro-electric stations in San Paulo, another in the State of Rio and a system of dams and reservoirs in Parana. The expenditure incurred during the five years ended 31st December, 1949, exceeded £19 million, and twice that amount will be laid out on extensions during the next five years. At least one-third of this sum will be spent on purchases of electrical material abroad. The company now supplies light and power to 340 Brazilian towns.

System Interconnection

In July last the Brazilian Traction, Light & Power Co., of Montreal, inaugurated a 200-mile transmission line linking up its systems in San Paulo and the Federal District, and a 50,000 kW frequency changer station at Aparecida, approximately mid-way between the two. The transmission line on the San Paulo side is operated at 230 kV, 60 c/s, while that from Aparecida to Fontes, Rio, is at 132 kV, 50 c/s. The frequency changer will allow one system to assist the other in emergencies, and the reservoirs at Ribeirao das Lages and Pombos Island to be more efficiently utilized. The project, exclusive of transformer substations, represents an investment of £4,600,000 and was carried out in eighteen months.

In July, also, the Canadian company installed a new generating unit of 92,000 h.p. at its main San Paulo station (Cubatao) and laid three 132 kV underground cables in the Federal District, the first to operate at this voltage in South America.

To relieve the difficult situation created in Rio de Janeiro by the prolonged drought, the company transferred a floating thermal station from Porto Rico and anchored it in the Guanabara Bay at Rio. It will supply an additional 25,000 kW until the capacity of the Ribeirao das Lages reservoir is increased. The unit is one of four built, at a cost of U.S. $4,500,000 each, in the United States during the war for the service of the armed forces.

In the two years ended October last the volume of water at Ribeirao das Lages decreased from 452,975,390 to 162,962,580 cu m, but consumption of electricity increased from 1,374·9 million to 1,439·4 million kWh. To provide for future increases an underground station now being constructed will contribute an additional 740,000 kW to the company's system. Two rivers are being partially diverted through tunnels measuring 11,000 and 2,200ft in order to raise storage capacity.

In September the Rio de Janeiro State Government inaugurated a hydro-electric station at Macabú to supply electricity to the northern part of the State, hitherto served by eight small stations with a total capacity of 4,672 kW. The Macabú River has been dammed at an altitude of 2,300ft and diverted to a power station built on the banks of the Rio San Pedro, 1,400ft below. A tunnel, 18,200ft long, conveys the water to the power plant of 9,000 h.p. Within the next few months the capacity of the reservoir will be raised to 70 million litres, and two more generating groups will be installed to double the power. By the end of 1952, when the project is completed, the capacity of the station will be 45,000 h.p. The project was drawn up in 1939 and entrusted to the representatives of Japanese industrialists, the cost being estimated at 35 million cruzeiros. The contract was rescinded in 1942 and work was resumed in 1945. The expenditure to 31st December, 1949, amounted to 188 million cruzeiros (£3,760,000). A company, formed with mixed state and private capital, will be organized to exploit the Macabú station and take over the existing small plants.

Further Developments

In October the Maranham Government obtained a federal grant of £80,000 towards the cost of building a hydro-electric station in that State. In October, also, the Minas Government began preparing the site for the 150,000 h.p. station to be built at the Fecho de Funil Falls, on the Paraopeba River. These cataracts are on a tributary of the San Francisco, approximately 900 miles from the

Paulo Afonso Falls, where another station, with an output of 112,000 kW, will be completed in 1953. Between these two points lies what has long been known as Brazil's "Lost Valley," a rich agricultural and mineral zone, hitherto unexploited. The long, narrow valley is isolated from the rest of the country by high mountain ranges and by impassable falls, which close the river at each end. Electrification will permit the industrialization locally of raw materials of animal, vegetable and mineral origin. Dams and sluices will be built to regulate the flow of water, preventing the periodical floods which now destroy farms and homesteads, and the channel will be made navigable throughout the year.

During 1950 work was accelerated on the 140,000 h.p. station at the Salte Grande Falls, on the Sapucahi River in Minas Geraes. The station will feed a potentially rich zone south-west of Belo Horizonte, in which development is retarded by inadequate installed capacity.

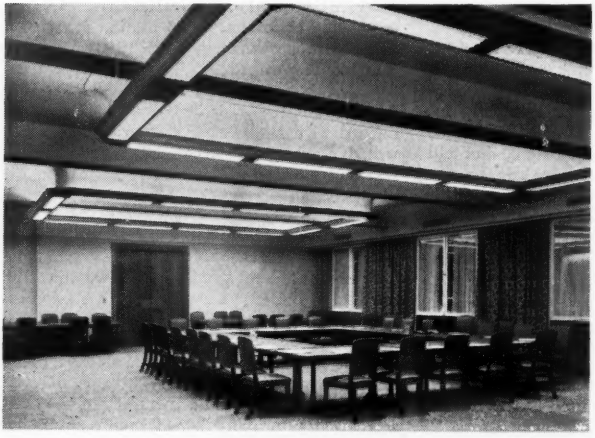
In November decrees were signed sanctioning the building of hydro-electric stations at Cachoeira Grande, on the River Correntina in Bahia, and on the Rio Santo Antonio in Minas Geraes. In addition, during the year several private enterprises were granted concessions to build small rural stations.

Lighting at B.E.A. Headquarters

FLUORESCENT lighting in two of the main conference rooms at the headquarters of the British Electricity Authority, Oxford Street, London, is sited to conform approximately with the layout of the conference tables, this arrangement giving a relatively high degree of light at table level whilst providing comfortable visual conditions overall. For comparison in this connection it is recorded that 25 to 35 lumens/sq ft is achieved on the tables, falling off to a minimum of 8 to 10 lumens/sq ft round the edges of the rooms.

The installation consists of a number of twin 80 W 5ft "Mazda" fluorescent lamps built into simple rectangular plaster features. Basically each unit consists of three pairs of mild steel hangers supporting both ends of a "T" section mild steel frame in which louvre panels are fitted. The plaster coving and side mouldings, giving a smooth outside finish, were added after the skeleton frame units had been fixed on prescribed centres, lined up and levelled, and the wiring completed. A reflector is provided within the framework and this is removable, in order to give access to the lamp control gear which is placed on a tray between the hangers.

The lamps are fixed in position from above and are placed in relation to the reflector in such a way that the louvre panel, including the outside strip, has a uniform brightness. The method of positioning also allows a wide distribution of upward light and the vertical portion of the cove above is lit only by reflection, thus avoiding conspicuous shadows between lamps. Direct glare is avoided by the use of the opaque plaster sides and "egg-crate" louvre panels which fully screen the lamps from normal view. There is also ample direct light to brighten the upper parts of the rooms, against which the louvred light sources are seen. The installation was designed by lighting engineers of the British Thomson-Houston Co., Ltd., in collaboration with the architects, Messrs. Norman and Dawbarn.



Specially designed "Mazda" fluorescent lighting in one of the conference rooms at the B.E.A. headquarters

Veneer Peeling

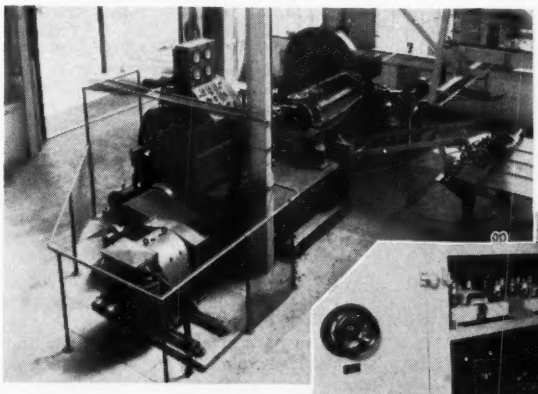
Electronic Control of Lathes

ONE method of cutting the hard and soft wood veneers used in the manufacture of plywood is to peel a continuous layer from the circumference of a suitable log in a special lathe. At the start, when the log is large, the rotational speed of the lathe must be relatively low in order to be able to handle the veneer, but when the log has been reduced to a smaller diameter a higher speed is necessary to maintain a reasonable production rate. Motor speed variation is therefore essential, and it is convenient if this can be done in a stepless manner.

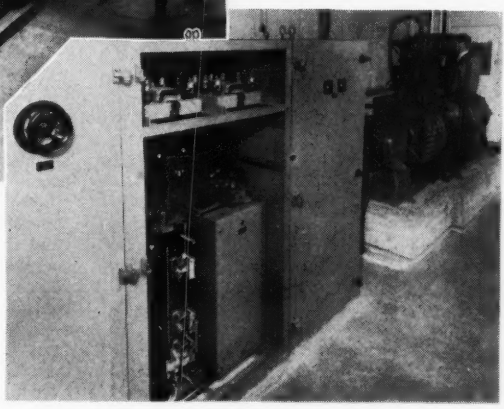
Two equipments in which these requirements have been attained by electronic methods have recently been supplied by the G.E.C. One of these is in service in India and the other, which is illustrated below, has been installed in the Forest Products Research Laboratory of the D.S.I.R. at Princes Risborough. Both installations have been provided with an additional control system whereby any selected veneer speed can be automatically maintained, independently of change in log diameter.

The 60 h.p. main driving motor is a compound wound d.c. machine with separately excited fields, operating over a speed range of 25/2,700 r.p.m. A 65 kW motor generator set provides d.c. for the main motor, and for speeds up to 900 r.p.m. Ward Leonard control is employed, higher speeds being obtained by field control of the main motor. The control gear for the complete equipment is housed in a sheet steel cubicle adjacent to the motor generator set, and is operated from a control panel near the front of the lathe.

The electronic speed control system utilizes a method in which the voltage output of one of two tachometer generators is compared with a standard reference voltage, the difference voltage being used to correct any speed discrepancy. The first tachometer generator, which is gear driven from the main driving motor and gives a voltage output proportional



Veneer peeling lathe at Forest Products Research Laboratory, Princes Risborough

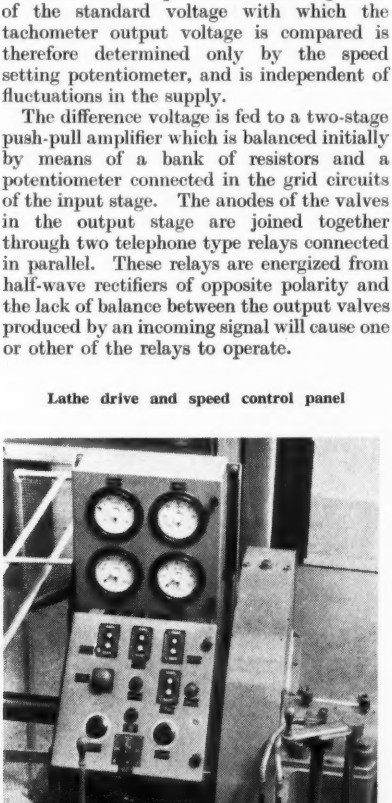


Lathe drive control cubicle, with motor generator set in background

to lathe spindle speed, is used for revolution control, i.e., for pre-setting the spindle speed. The second generator, which is gear driven from a roller which in turn is driven by the log, gives a voltage output proportional to the peripheral speed of the log, and is used for peeling at constant rate of take-off. The standard voltage is derived from a speed setting potentiometer connected across a transformer which has a voltage output constant to $\pm$ 0·5 per cent for an input variation of $\pm$ 10 per cent. The magnitude of the standard voltage with which the tachometer output voltage is compared is therefore determined only by the speed setting potentiometer, and is independent of fluctuations in the supply.

The difference voltage is fed to a two-stage push-pull amplifier which is balanced initially by means of a bank of resistors and a potentiometer connected in the grid circuits of the input stage. The anodes of the valves in the output stage are joined together through two telephone type relays connected in parallel. These relays are energized from half-wave rectifiers of opposite polarity and the lack of balance between the output valves produced by an incoming signal will cause one or other of the relays to operate.

Lathe drive and speed control panel



Each relay is provided with two sets of normally open contacts, one of which closes the pilot contactors of the appropriate motor operated potentiometer, thus varying either the field or armature supply of the main driving motor in such a manner as to oppose the speed fluctuation which produced the initial signal. The second set of contacts cuts out sufficient bias resistance from the input circuit of the amplifier to restore the balance of the output valves for small out-of-balance voltages, thus releasing the armature of the relay concerned, and by this means the main driving motor is prevented from hunting. Small out-of-balance voltages thus produce a rhythmic operation of one or other of the telephone relays, and the frequency of this operation can be controlled by adjusting the capacitors in the grid circuits of the first stage of the amplifier.

Peeling Operation

After the log has been mounted in the lathe it is revolved slowly by means of the inching buttons mounted on the control panel, and surface flaws are removed with a hand tool. For the rounding operation which follows, the revolution control potentiometer is set to a suitable low speed, and as soon as a continuous veneer is evolved the clutch is disengaged and the end of the veneer is wrapped round the take-up spool. The clutch is then re-engaged for a few revolutions to start the spooling. The peeling operation is then started under revolution control, and, if desired, can continue under this form of control at any selected spindle speed. Alternatively, the take-off control button can be pressed, and peeling will then proceed at the selected peripheral speed.

The take-off control can only be engaged when the roller is in contact with the log and the log is revolving. The change-over from revolution control is effected by a relay which, in its normal unenergized condition, is in the revolution control position. A protective relay is connected across the log speed tachometer generator, and only when the voltage of this generator is sufficient to close the protective relay will operation of the take-off control push-button cause the change-over relay to move to the take-off control position. If at any time the log tachometer generator should become disengaged from the log and stop, the protective relay will open and automatically return the change-over relay to the revolution control position.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Electric & Musical Industries, Ltd.—In the course of his speech at the annual meeting held on 15th December, Sir Alexander Aikman (chairman) said that the turnover showed a satisfactory increase over the previous year, but net margins were lower. This was caused by the increase in the cost of raw materials and wages which had already begun to make themselves evident during the previous year, and which continued throughout the year under review. In anticipation of the opening of the Sutton Coldfield television transmitter at the end of last year, plans were made to produce television receivers in large quantities, but due to the crippling burden of purchase tax their plans could only be carried out by working to a smaller margin. The total turnover of the English subsidiaries showed an increase over the previous year of 11 per cent and the value of goods exported represented 24 per cent of the total sales. The turnover of the British overseas subsidiaries also showed an increase.

They had recently received a contract from the B.B.C. to design and manufacture what would be the two most highly powered television transmitters in the world. These were for the Scottish and Western Region television stations. Further research and development of the C.P.S. Emitron television cameras and camera tubes had resulted in great improvement. Their research scientists had produced a new television transmission aerial system, which had a number of superior qualities over those previously used in this country and abroad and a new type of aerial-feeder which had been adopted by the B.B.C. for their Scottish and Regional stations. Their Research Department had also produced a new television relay-link which gave greater range and power than any of its competitors. The chairman concluded with a review of the company's overseas subsidiaries.

First Electric Corporation of South Africa, Ltd.—The annual meeting was held recently in Johannesburg, Mr. H. F. Oppenheimer (chairman) presiding. In the course of his address the chairman said that at the Knights Works considerable progress was made during the year in the change-over to Associated Electrical Industries designs. The major portion of the development programme was completed and the manufacture of various types of motors on a mass production basis was commenced in March of this year. In addition to increasing the output of motors, the factory was also engaged in producing other A.E.I. designed products, such as switchgear, cubicles, liquid controllers, starters and transformers. The range of motors manufactured covered 1-500 h.p. but in conjunction with the Marthinusen Works, motors up to 2,000 h.p. were also being produced. There had been a steady demand for Westinghouse Brake products and this had resulted in the production of quantities of battery chargers. Referring to the companies in the group, the chairman said that the capacity of the transformer department of L. H. Marthinusen, Ltd., was now being fully utilized. The Corporation had entered into an arrangement with Metropolitan-Vickers of South Africa (Pty.), Ltd., and British Thomson-Houston Co. South Africa (Pty.), Ltd., whereby these two companies would be responsible for the sale of such of the Corporation's products as were manufactured to the designs and specifications provided by A.E.I., Ltd.

At an extraordinary meeting which followed the annual meeting a resolution was passed increasing the directors' borrowing powers from 50 per cent to 75 per cent of the issued capital of the Corporation.

Turner & Newall, Ltd., report a group profit for the year ended 30th September last of £7,154,468, as compared with £6,274,079 for the preceding year. It is proposed to pay a final ordinary dividend of 13¾ per cent (against 11¼ per cent) with a special anniversary bonus of 2½ per cent, making a total distribution for the year of 20 per cent (against 15 per cent).

The London Electric Wire Co. & Smiths, Ltd.—Treasury consent has been obtained to an issue of 315,930 £1 ordinary shares at £2 each to ordinary stockholders in the proportion of nine shares for £20 stock.

Telephone Rentals, Ltd., has declared an interim dividend of 4 per cent (unchanged).

British Insulated Callender's Cables, Ltd., has announced an interim dividend of 2 per cent less tax (same) on the ordinary capital.

The London Electric & General Trust, Ltd., has declared an unchanged interim dividend of 2 per cent.

S. Smith & Sons (England), Ltd.—The rights issue of ordinary shares announced last month is now being underwritten. Holders of the ordinary capital which resulted from the reorganization of capital are to be offered three new 4s shares for every five held at a price of 6s per share.

Bankruptcies

P. H. Leach, 4, Oxford Street, Guiseley, near Leeds, lately carrying on business at 4, Oxford Street, Guiseley and 6 & 8, Town Street, Yeadon, Yorks, radio and electrical engineer.—Receiving order made 5th December on debtor's own petition.

J. Shelvey, carrying on business as "Vesta-Shelvey Electric Installations" at Vesta Manufacturing Works, L.M.S. Goods Department, Oakengates, Salop, electrical engineer.—Receiving order made 7th December on debtor's own petition.

H. H. Baron, residing and carrying on business at 84, Duckworth Street, Darwen, Lancs, electrician.—Order made 13th November granting discharge subject to bankrupt consenting to judgment being entered against him by the Official Receiver for the sum of £148 10s and £1 10s costs of judgment.

L. W. Aldis, residing and carrying on business at Greengates, Top Street, Rattlesden, and previously residing and carrying on business at Lyndhurst Cottage, Woolpit, Suffolk, electrical engineering contractor.—First and final dividend of 5s 0½d in the £, payable 22nd December at the Official Receiver's office, 13A, Great Colman Street, Ipswich.

E. Whittington, carrying on business under the name of "Modern Electric Service" at Mona Villa Works, Clifton Lane, Rotherham, manufacturer and electrical engineer.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, released 24th November, 1950.

J. T. Southwood, 13, Brandreth Road, Compton, Plymouth, formerly carrying on business at Belgrave Garage, Mutley, Plymouth, electrical engineer.—Supplemental dividend of 1s 2 15/16d in the £, payable at the Official Receiver's office, 24, Lockyer Street, Plymouth.

J. H. Trevithick, 51, Fore Street, Callington, Cornwall, electrician, a partner in the firm of Power, Light & Sound.—First and final dividend of 2s 3 29/32d in the £, payable at the Official Receiver's office, 24, Lockyer Street, Plymouth.

Liquidations

Tok Switches, Ltd.—Winding up voluntarily. Liquidator, Mr. F. W. Charles of Peat Marwick Mitchell & Co., 11, Ironmonger Lane, London, E.C.2.

Tufcan Electrical Industries, Ltd.—Particulars of claims by 30th January to Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, one of the liquidators.

Next Week's Events

Tuesday, 2nd January

BATH.—Electricity Showrooms, 7 p.m. I.E.E. Bristol Students' Section. "Magnetic Amplifiers," by E. Erkman.

Wednesday, 3rd January

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

NEWCASTLE-ON-TYNE.—Minor Durrant Hall, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "Design of School Lighting," by J. F. Roper.

OXFORD.—S.E.B. Showrooms, 37, George Street, 7 p.m. I.E.E. District Meeting. "General Developments in Modern Lighting," by S. Anderson.

SALISBURY.—17, New Canal, 6.30 p.m. I.E.E. Southern Centre. "The Control of Hydro-Electric Plant," by A. C. H. Frost and W. Brittlebank.

Thursday, 4th January

CARDIFF.—South Wales Electricity Board, The Hayes, 5.45 p.m. Illuminating Engineering Society Cardiff Centre. "Lighting of Departmental Stores," by A. Jervis.

EXETER.—Agricultural House, Queen Street, 7 p.m. I.E.S. Exeter Group. "Floodlighting," by R. S. Hazell.

Friday, 5th January

BATH.—S.W.E.B. Showrooms, 7 p.m. I.E.S. Bath and Bristol Centre. "Floodlighting," by R. S. Hazell.

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.S. Birmingham Centre. "Commercial Lighting of Big Stores," by L. E. Gibbs.

LONDON.—At the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Electrical Engineers. "Mechanical Handling." (Joint meeting with the I.Mech.E.)

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Automatic Welding," by E. Hindson.

NEWCASTLE-ON-TYNE.—King's College, 6.30 p.m. I.E.E. North Eastern Students' Section. Students' Lecture. "Research in Electrical Engineering," by Dr. K. J. R. Wilkinson.

Saturday, 6th January

BIRMINGHAM.—Grand Hotel. Birmingham Electric Club. Children's Party.

STOCKS and SHARES

THE year which is now practically closed from the Stock Exchange point of view has been a chequered period for every market round the House. The volume of business has ebbed and flowed more erratically than usual. At no time could it have been said that business was generally good ; nor, on the other hand, that bad news produced anything worse than a temporary semi-paralysis. In fact, there have been so many shocks during 1950 that markets may almost be said to have become immune to conditions which might otherwise have been expected to lead to serious apprehension on the part of investors and speculators.

The year has been disappointing in many ways, more particularly, of course, in regard to the continued and additional ferments that have arisen abroad. By and large, however, it must be admitted that Stock Exchange prices have stood up to the various crises with a surprising degree of firmness. In spite of the after-effects of devaluation, and the pressing claims of ever rising costs, money in plenty has been forthcoming for new issues.

Tube Investments Preference

Unless something very unexpected intervenes, a good welcome awaits the proposed capital issue by Tube Investments. As soon as possible the company intends to offer for sale five million 4½ per cent preference shares at £1. This will help to relieve a persistent shortage of first-class issues of the kind, and by present standards the terms are distinctly favourable. Henley's Telegraph 4½ per cent preference, for instance, stand at 22s 6d, and a buyer has to pay another 7½d per share to cover transfer-stamp and commission. Other leading preference shares are similarly on a 4 per cent yield basis, Reyrolle and Siemens "fours," for example, being quoted within a few pence of par at the time of the Tube Investments announcement.

Expansion Plans

Mr. Stedeford's annual statement at the Tube Investments meeting in the middle of this month covered so wide a field as to serve as a general review of industrial conditions. Of particular interest is his concern about the effect of shortages on those sections of the business which will have to take second place to the needs of the armament programme. He discussed industry's universal inability, with taxation as it is, to finance expansion out of retained profits. From the latest surplus of £6¼ million, T.I. distributed little over half-a-million to stockholders, but could retain in the business only £2·1 million after the tax collector's portion of over £3½ million. Hence the new capital issue.

Christy Brothers New Ordinary

A final call of 15s 6d per share is due on 13th January on the new ordinary shares offered at 20s 6d as "rights" to shareholders of Christy Brothers (Chelmsford). Until that date, the shares will be available in the form of renounceable allotment letters, and consequently free of the 2 per cent transfer stamp duty. They have been changing hands at a few pence over the issue price, and will be entitled to one quarter of the dividend paid for the year ending next March. For 1949/50 the dividend was 6 per cent—a distinctly conservative payment.

Hoover's Bonus

Initial reactions to Hoover's announcement of a 100 per cent share bonus demonstrated again the market disposition to link optimistically these capital operations with the matter of dividends. Quoted below 50s before the declaration a fortnight ago, the shares changed hands thereafter up to 54s before settling down a shilling or two below that figure. Earlier this year, the interim had been raised from 10 to 15 per cent, with the reservation that this did not necessarily imply a larger total. On the 45 per cent paid for 1949, the yield on the shares is not much over 4¼ per cent. Reserves to cover the proposed bonus were ample, according to the last balance sheet. This was particularly notable for the amount of ready assets, which came to nearly £3 million net, including over £2 million in cash and tax certificates.

Coming Dividends

Westinghouse Brake & Signal ended their financial year in September and the dividend, with preliminary figures, is expected early in the New Year. The company makes a single annual payment, which has been at the rate of 14 per cent on the last seven occasions, the last being covered by group earnings equal to 39½ per cent. Currently quoted at 61s 3d, the shares yield £4 11s 6d per cent. Aberdare Cables accounts closed in October. A few weeks earlier the chairman was of the opinion, based on results of the first nine months of the year, that the 10 per cent interim could be followed by a final of the same amount, leaving a substantial addition to reserves. On that assumption, the yield on the 5s shares at 13s 9d is 7¼ per cent. The Rheostatic Company's year also ended in September, and the dividend appeared this year in March. On the last distribution, equal to 14 per cent after allowing for a 50 per cent capital bonus, the 4s shares at 8s pay 7 per cent on the money.

ELECTRICITY SUPPLY

Proposed Tariff Criticized

Power Cuts and the Rota System

THE Yorkshire Electricity Consultative Council, at a meeting at Sheffield, discussed the Board's proposals for a new domestic tariff based on the number of rooms in the house rather than on the rateable value. A statement was afterwards issued saying that the Council, while it greatly deplored the effect that the proposed new tariff would have on a large number of consumers, felt that it had no option but to accept the type of tariff proposed. In view of the Board's favourable financial position, however, the Council requested the Board to reconsider the proposal with a view to the introduction of a tariff which would give easement to the number of consumers who would be faced with increased charges. The Board's suggested tariff was : Houses with not more than three rooms, 4d/kWh up to 26 kWh a quarter and ¾d/kWh thereafter. For each additional room up to sixteen the number of kWh at the primary rate would be increased by nine. Consumers with prepayment meters would be charged 5d instead of 4d.

Radcliffe Breakdown

A fault at Radcliffe power station on 14th December caused the stoppage of all services on the main Manchester to Bury electric railway for two periods amounting to an hour and a reduced service was run for the remainder of the peak period. It was stated that the overhead connection parted on the bus bars and a busbar fault developed. It was impossible to isolate the trouble and this caused a total stoppage of the station.

Load Shedding in North West

At a meeting held at Manchester the North Western Electricity Consultative Council adopted a resolution urging the B.E.A. to simplify plant, buildings and site works in order to hasten the building of new power stations. Mr. O. Howarth, chief engineer of the North Western Electricity Board, mentioned the possibility of introducing a rota for power cuts and of extending an experiment by which industrialists would be warned of impending cuts. He said he fully appreciated the advantages to the consumer of a rota with a named day, and as soon as the Board felt that its technical improvements gave a prospect of success it would try to operate such a system, perhaps initially in a part of the Area. A system of warnings for industrialists was already being tried out in one part of the Area. Unfortunately the equipment necessary for the system took time to obtain and install.

River Wye Scheme

Representatives of interested authorities, including Birmingham Corporation, recently held a conference at Hereford to discuss the British Electricity Authority's scheme to extract the headland waters of the River Wye for power station purposes. A resolution was passed strongly objecting to the scheme so far as it affected the Wye. The Monmouthshire representatives—the only ones supporting the plan—maintained that it was in the national interest and would not seriously interfere with the water supplies or endanger the fisheries. The proposal, it was stated, was to abstract water from the upper reaches of the Wye and two tributaries, the Afon Cyff and Afon Terenig, up to a maximum of 95 million gal a day (average 31 million) by leat and tunnel and divert it into a large reservoir at the head of the Afon Rheidol.

Objection to Overhead Line

The Stanley (Co. Durham) Urban District Council is objecting to the proposed erection of an overhead line from Stella to West Pelton. The proposed line would pass over land intended for use as a trading estate. The Council also fears that the scheme might interfere with the possible erection of a television station at Pontop Pike, Dipton. Experiments in connection with the latter proposal have already been carried out by the B.B.C.

Street Lighting

Wigan Street Lighting Committee announces that all gas lamps will be replaced by electric lamps as soon as possible. Of the 2,750 street lamps now in use, about 1,000 are electric.

Gosforth (Northumberland) U.D.C. has approved a £3,445 scheme for relighting the High Street and an adjoining stretch of the Great North Road with 117 sodium lamps. Maintenance costs will be about £854 annually compared with £1,299 for the present gas system.

Ministry of Transport approval has been given to provision of new lighting in side streets at Spalding.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

22734. Marconi's Wireless Telegraph Co., Ltd.—Navigation aiding radio systems. 30th July, 1946. (649322.)

1947

8827. British Thomson-Houston Co., Ltd.—Starting strips for electric discharge devices. 1st April, 1947. (649181.)

22680. Mills, E. F. H.—Manufacture of wiring circuits such as for radio receivers. 29th July, 1948. (649254.)

22681. Mills, E. F. H.—Manufacture of wiring circuits. 28th July, 1948. (649255.)

23572. Soc. Independante de Télégraphie sans fil.—Modulated amplifiers. 26th August, 1947. (649259.)

24505. Standard Telephones & Cables, Ltd.—Selector switches. 5th September, 1947. (649185.)

25920. Lucas, Ltd., J., and Copage, C. M.—Electromagnetic apparatus for testing metal articles. 14th October, 1948. (649330.)

26218. Payne, E. M., and Harrison, H. M.—Sound reproducing apparatus. 25th September, 1948. (649260.)

26807. Standard Telephones & Cables, Ltd., and Braendle, E. W.—Thermionic valve cyclic control arrangements. 1st October, 1948. (649332.)

27048. Marconi's Wireless Telegraph Co., Ltd., and Head, L. R.—Noise limiter circuit arrangements. 27th May, 1948. (649262.)

30357. Tecalemit, Ltd., and Mason, V. B. H.—Automatic control apparatus for the actuation of electric switches, valves and other devices at timed intervals. 10th December, 1948. (649263.)

30694. Standard Telephones & Cables, Ltd., and Garfield, W. L.—Remote indication of electricity supply frequency. 12th November, 1948. (649264.)

31541. Shaw, W. L., and Fenwick, J.—Radio direction-finding installations. 22nd December, 1948. (649338.)

33790. Yorkshire Electricity Board and Mell, R. E.—Apparatus for checking the speed of rotating bodies. 22nd December, 1947. (649341.)

1948

2003. Standard Telephones & Cables, Ltd.—Electron velocity modulation apparatus. 22nd January, 1948. (649273.)

3139. Standard Telephones & Cables, Ltd., Bray, F. H., Wilson, M. T., Ormrod, D. H., and Johnstone, S. G. W.—Automatic telecommunication exchange systems. 28th January, 1949. (649347.)

3153. Nuttall, C. T.—Arrangements for supplyin energy to electric discharge lamps. 3rd March, 1949. (649274.)

4203. Revo Electric Co., Ltd., and Hartill, P.—Prismatic panels for use in connection with lighting fittings or lanterns. 12th February, 1949. (649280.)

5480. British Thomson-Houston Co., Ltd.—Electric switching means. 24th February, 1948. (649193.)

5528. Robertshaw-Fulton Controls Co.—Snap-action electric switch devices. 24th February, 1948. (649194.)

7652. Kent, Ltd., G., and Grout, J. A. M.—Automatic control of superheated steam temperature. 14th March, 1949. (649350.)

13273. Sterne & Co., Ltd., L., and Carruthers, D. S.—Cooling apparatus for ice-cream mixers. 16th May, 1949. (649456.)

10214. Churchill, A.—Electrically-controlled locks and switches. 25th March, 1949. (649284.)

15107. Singer Manufacturing Co.—Radio-frequency bar sealer for seaming dielectric sheet material. 4th June, 1948. (649356.)

15186. British Thomson-Houston Co., Ltd.—Regulation of dynamo-electric machines. 4th June, 1948. (649357.)

15687. Cambridge Instrument Co., Ltd., Sutton, C. D., and Sanderson, L. G.—Instrument recording pens. 10th June, 1949. (649461.)

15997. Philips Electrical, Ltd.—Coolers for discharge tubes. 14th June, 1948. (649362.)

17421. Hass, Z. K.—Ultra high-frequency radio apparatus employing wave guides. 26th May, 1949. (649301.)

18886. Simplex Electric Co., Ltd., and Osborn, F. W.—Combined electric switch-and-socket units. 13th July 1949. (649387.)

19338. Metropolitan-Vickers Electrical Co., Ltd., and Scoles, G. J.—Heat-sensitive apparatus. 12th July, 1949. (649392.)

19788. Blackburn & General Aircraft, Ltd., Saunders, C. G., and Piper, R. H.—Automatic start-up and shut-off controller for a voltage regulator of a current generator. 25th July, 1949. (649394.)

19883. Philips Electrical, Ltd.—Electrical cavity resonators. 26th July, 1948. (649395.)

19988. Ericsson Telephones, Ltd., Distin, L. S., and Wilman, C. V.—Circuits for electrical interrupters. 23rd July, 1949. (649200.)

20026. Igranic Electric Co., Ltd., and Randall, C. E.—Devices for protecting polyphase circuits. 27th July, 1948. (649201.)

20806. Western Electric Co., Inc.—Signalling systems. 6th August, 1948. (649470.)

21135. Philips Electrical, Ltd.—Television receivers. 11th August, 1948. (649471.)

21189. Dubilier Condenser Co. (1925), Ltd. (Dubilier, W.).—Electro-magnetic devices. 8th September, 1949. (649398.)

21295. Westinghouse Electric International Co.—High-frequency oscillators. 12th August, 1948. (649400.)

22014. Westinghouse Electric International Co.—Gas turbine power plants. 20th August, 1948. (649402.)

23004. Nielsen, F. M.—Apparatus for detecting faults in electronic circuits. 1st September, 1948. (649403.)

23224. Standard Telephones & Cables, Ltd., and Hargreaves, T. F. S.—Modulators for carrier telegraph systems. 2nd September, 1949. (649312.)

24075. Pirelli-General Cable Works, Ltd.—Plants for the continuous vulcanization of electric conductors. 14th September, 1948. (649482.)

24076. Pirelli-General Cable Works, Ltd.—Machines for the continuous extrusion of metal tubes. 14th September, 1948. (649483.)

24139. Loeb, J. M.—Apparatus for phase discriminating between electric currents of commensurable frequencies. 14th September, 1948. (649485.)

24443. British Thomson-Houston Co., Ltd.—Electrical ballasts particularly for electric discharge devices. 17th September, 1948. (649486.)

25433. Watt Gluhlampen-Und Elektrizitats-Akt.-Ges.—Arrangement for securing the cap to a vessel enclosing the electrode system of an electron tube. 29th September, 1948. (649410.)

25605. Westinghouse Electric International Co.—Electric generating systems. 1st October, 1948. (649411.)

26091. Macdonald, I. G.—Inertia-operable electric switches. 6th October, 1949. (649415.)

26262. Singer Manufacturing Co.—Electric motor with clutch-brake drive. 8th October, 1948. (649495.)

26319. General Electric Co., Ltd., and Harrold, A. E.—Variable electrical capacitors. 29th September, 1949. (649316.)

26442. Philips Electrical, Ltd.—Devices for the transmission of ultra-high-frequency electro-magnetic waves through dielectric waveguides. 11th October, 1948. (649214.)

27281. Metropolitan-Vickers Electrical Co., Ltd., Ghalib, S. A., Kelsall, R. H., and Heys, E.—Lathes, boring machines, and the like. 21st September, 1949. (649219.)

27424. Birmingham Sound Reproducers, Ltd., and Clay, D. L.—Instruments for measuring alternating voltage. 19th October, 1949. (649422.)

27531. British Thomson-Houston Co., Ltd.—Refrigerating systems. 22nd October, 1948. (649373.)

27719. Siemens Bros. & Co., Ltd., Gachet, E. J., and Hards, E. J.—Electro-magnetically-operated driving mechanisms. 2nd September, 1949. (649427.)

28037. British Thomson-Houston Co., Ltd.—Motor control for waste disposal units. 28th October, 1948. (649225.)

28404. Compagnie Electro-Mécanique.—Machine for winding electric machine stators. 2nd November, 1948 (649432.)

28432. British Thomson-Houston Co., Ltd.—Contact bases for tubular electric lamps. 2nd November, 1948. (649433.)

28948. Stevens, A. H. (Stackpole Carbon Co.).—Electric circuit controls. 8th November, 1948. (649434.)

29597. Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—Electric pulse code modulation systems of communication. 15th November, 1948. (649376.)

30152. British Thomson-Houston Co., Ltd.—Clothes-washing machines. 19th November, 1948. (649232.)

30640. Marryat & Scott, Ltd., and Honey, L. W.—Lifts. 24th November, 1949. (Addition to 584343.) (649437.)

30742. Fox, P. X.—Variable electric resistances or potentiometers. 15th November, 1949. (649438.)

32313. Baertl, P.—Electric contact instrument for detecting rises of temperature. 14th December, 1948. (649241.)

32547. Fielden (Electronics), Ltd., and Fielden, J. E.—Moisture detecting or measuring devices. 10th December, 1949. (649242.)

32907. Huttenwerke Ruhrort-Meiderich Akt.-Ges.—Process for the manufacture of transformer and dynamo steels. 20th December, 1948. (649199.)

1950

9534. Nuttall, C. T.—Arrangements for supplying energy to electric discharge lamps. 3rd March, 1949. (Divided out of and addition to 649274.) (649320.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 13th December.

TOM THUMB. No. 681,597, Class 7. Electricity generators; electric motors and internal combustion engines, none being for land vehicles; and parts included in Class 7 of internal combustion engines.—A. C. Morrison, The Four Gables, 52, Woodhouse Road, Quorn, Leics.

No. 690,541 (design). DIE STIMME SEINES HERRN. No. 690,551. HIS MASTER'S VOICE. No. 690,556. All Class 7. Washing, ironing, drying, wringing, dishwashing, food mixing, food mincing, fanning and blowing, and food grating machines, all being electrically operated; and parts of and fittings for all such goods, all included in Class 7. No. 690,543 (design). DIE STIMME SEINES HERRN (design). No. 690,548. DIE STIMME SEINES HERRN. No. 690,553. HIS MASTER'S VOICE. No. 690,558. All Class 11. Apparatus for heating, cooking, drying, ventilating and refrigerating, and parts of and fittings for all such goods, all being included in Class 11.—The Gramophone Co., Ltd., Blyth Road, Hayes, Middx.

FIBRAK. No. 681,770, Class 9. Separators being parts of electric batteries.—Oldham & Son, Ltd., 36, Hyde Road, Denton, near Manchester.

TELETIM. No. 684,576, Class 9. Apparatus for measuring the duration of telephone calls.—Max Gate, Ltd., 34, Aston Street, Birmingham, 4.

WILMAC. No. 687,782, Class 9. Electrical apparatus included in Class 9, and scientific and nautical apparatus; but not including flat irons or any goods of the same description as flat irons.—William McGeoch & Co., Ltd., 28, West Campbell Street, Glasgow, C.2.

COMBELL. No. 691,914, Class 9. Electrical apparatus and instruments included in Class 9.—H. Muller, 16, Alexander Road South, Manchester, 16.

No. 681,946 (design). Class 9. Electrical apparatus and instruments included in Class 9; and scientific and nautical, signalling, and checking (supervision) apparatus and instruments; and parts included in Class 9 of all the aforesaid goods.—Etablissements Ed. Jaeger, 2, Rue Baudin à Levallois-Perret (Seine), France. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.1.

SAMTILEC. No. 691,978, Class 11. Electrically heated towel rails and electrical heating apparatus.—Samuel Timings & Co., Ltd., 88, Hamstead Road, Birmingham, 19.

Cable-Couplers for Mines

BOLTED flameproof cable-couplers of the link and contact pin and tube types for use in mines are the subject of the revised B.S.912. The most important changes since 1940 are:—The pin and tube type for 100 and 200 A within the 600 to 3,000 V range is omitted because a new standard specification for interchangeable couplers of these ratings is being prepared. Special provision for earthing continuity is no longer required when brass or copper boxes are coupled. New clauses have been added concerning certification and marking. Copies of the revised specification are obtainable for 2s post free from the British Standards Institution, 24, Victoria Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Baldock.—8th January. U.D.C. Street lighting equipment. (See 22nd December issue.)

Belfast.—11th January. City Council. Electrical installation at proposed Old People's Home, Whitehouse. City surveyor, Architectural Section, Room 85, City Hall.

19th January. Electricity Department. Fire fighting equipment and 33 kV and lower voltage cables. (See 22nd December issue.)

Blackpool.—6th January. Corporation. Chassis and sectional tower body and four tower ladders. (See this issue.)

Bridge of Allan.—5th February. Burgh Council. Street lighting equipment. (See 22nd December issue.)

Dagenham.—6th January. Borough Council. Electric lamps and supplies for the year commencing 1st April, 1951. Borough engineer, Civic Centre.

Hastings.—8th January. Corporation. Electrical installations in 116 houses. (See 22nd December issue.)

Huntingdon.—18th January. R.D.C. Wiring of houses at Stow Road, Spaldwick; Easton Road, Easton; Church Lane, Brington; Thrapston Road and Grafham Road, Ellington. Surveyor, Montagu House, Huntingdon.

Lincolnshire.—20th January. County Council. Electrical work at Stoke Rochford Hall, Kesteven Training College. (See 22nd December issue.)

London. — CAMBERWELL. — 8th January. Borough Council. Supply of electric lamps for one year from 1st April, 1951. Borough surveyor, Town Hall, S.E.5.

24th January. Metropolitan Water Board. L.v. switchboard at Ashford Common pumping station. (See 22nd December issue.)

New Zealand.—1st May. State Hydro-Electric Department. Twelve 110 kV potential transformer banks. (C.R.E. (I.B.) 72604/50. Ten/1953.)*

Southern Rhodesia. — SALISBURY. — 11th January. Public Works Department. Two electric passenger lifts, one electric bed passenger lift, and one food trolley lift. (C.R.E. (I.B.) 72924/50. Ten/1964.)*

UMTALI.—31st January. Municipality. Four 300 kVA and six 200 kVA transformers. (C.R.E. (I.B.) 73356/50. Ten/1977.)*

United States.—LAKE SUCCESS (N.Y.).—8th January. Television equipment. (C.R.E. (I.B.) 72118/50. Ten/1957.)*

Uruguay.—MONTEVIDEO.—10th February. Administracion Nacional de Puertos. Twenty electric cranes and forty-four electric hoisting tackles. (C.R.E. (I.B.) 73266/50. Ten/1976.)*

West Riding.—29th January. County Council. Renewal of electrical installation at Rothwell Grammar School. (See this issue.)

ORDERS PLACED

Bath.—Corporation. Recommended. Electrical installation at Southdown Junior School (£2,762).—Burchill & Morgan, Ltd.

London.—County Council. Electrical installations in schools:—Langford Road, S.W.6.—E. & C. Champion. Rushmore Road.—T. Westcott & Sons.

M.W.B. Works and Stores Committee. Recommended. Two sets of electrically driven borehole and force pumps with accessories, Chingford Mill Pumping Station.—Hathorn Davey & Co., Ltd.

Nuneaton.—Corporation. Electrical installation at Middlemarch School (£1,497).—Lee, Beesley & Co.

Peterborough. — Corporation. Recommended. Electrical installations in 104 houses, Eastfield Housing Estate (£3,350).—M. F. Hansen.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Flats (18), Alnmouth, for the R.D.C.; R. & G. Brown, Ltd., builders, Amble.

Bangor (Co. Down).—Houses (289); Northern Ireland Housing Trust, 12, Hope Street, Belfast.

Barking.—Factory extensions, Hertford Road; Harry Green, Ltd., soap manufacturers, Ajax Works.

Barnstaple.—Reconstruction of Albert Hall (£31,500); Woolaway & Sons, builders, Sticklepath, Barnstaple.

Bishop Auckland.—Houses (118), Woodhouse Close estate, for the U.D.C.; Edwin Pye & Son, builders, Bishop Auckland.

Bolton.—Pathological and post mortem block at Royal Infirmary; Bradshaw, Gass and Hope, architects, 19, Silverwell Street.

Bristol.—Laboratories for Imperial Smelting Corporation, Ltd., Avonmouth; John Morgan, Ltd., 14, Cathedral Road, Cardiff.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Burnley.—Junior school, Woodgrove Road; Leach, Rhodes and Walker, architects, 15, Manchester Road, Middleton.

Cardiff.—Grammar school for boys, Colchester Avenue (£185,976); W. T. Hills & Co., quantity surveyors, 3, Castle Street.

Cawston (Norfolk).—Primary school; G. W. Oak, architect, Education Offices, Stracey Road, Norwich.

Chester-le-Street.—Houses (95); F. Bowman, R.D.C. architect.

Darlington.—Remodelling of Darlington Maternity Hospital for the Newcastle Regional Hospital Board, Newcastle-on-Tyne (£130,000); Board's chief architect.

Derby.—Factory, Breadsall, for E. W. Bliss, Ltd., power press makers; Gee, Walker & Slater, Ltd., builders, Derby.

Durham.—Blocks of flats, Church Street; city engineer.

Grammar technical school, Durham City, for the C.C. (£236,991); George Dougill & Sons, Ltd., builders, Chestnut Street, Darlington.

Eccles.—Flats (24) and houses (56); borough surveyor.

Erith.—Flats (102), Hurst Place estate; borough engineer.

Fleetwood.—Houses (74), West View estate; borough surveyor, Town Hall.

Flintshire.—Technical school, Kelsterton (£435,043) and modern school at Buckley (£190,502); county architect, County Buildings, Mold.

Gwyrfai.—Factory at Penygroes (£50,000); R. and D. Hall, architects, National Provincial Bank Chambers, Bangor.

Hainault (Essex).—New factories; Gla-Rev Products, Ltd., Selinas Lane, Dagenham and S. Hille & Co., Ltd., 439, Lea Bridge Road, E.10.

Heston.—Houses (50) for B.O.A.C.; T. F. Nash, Ltd., builders, Hayes.

Hexham.—Nurses' home at Hexham General Hospital for the Regional Hospital Board (£29,911); T. D. Bird & Co., builders, Hexham.

Hornchurch.—Dwellings (54), Claremont Road and Park Lane, for U.D.C.; P. L. Cox, clerk, Council Offices.

Hull.—Two ward blocks, Winestead Colony, Patrington; architect to Leeds Regional Hospital Board, 29/31, Eastgate, Leeds, 2.

Isle of Ely.—Scheme for homes for the aged and infirm at five centres (about £100,000); R. D. Robson, county architect, County Hall, March, Cambs.

Jarrow.—Factory, Bede trading estate; S. J. Stephenson and Gillis, architects, Saville Chambers, North Street, Newcastle-on-Tyne.

Kingston - on - Thames.—Extensions to grammar school, Fairfield Road; borough engineer.

Liverpool.—Factory, Kirkby trading estate; Albright & Wilson, Ltd., Oldbury, Worcs.

Extensions to factory of H. Tramer, Ltd., Edwards Lane, Speke; W. Crosby & Sons, Belle Vale Road, Gateacre

London.—BATTERSEA.—New block at St. James' Hospital (£267,000), including outpatients' department, restaurant, kitchen, etc.; South West Metropolitan Regional Hospital Board, Portland Place, W.1.

BISHOPSGATE.—Rebuilding factory; Gotlop & Co., Ltd., clothiers, Artillery Lane, E.1.

BLOOMSBURY.—Buildings, 13-16, Russell Square, W.C.1, for Marcus estates (£300,000); Sir R. McAlpine & Sons, builders, 80, Park Lane, W.1.

MARYLEBONE.—Block of offices and block of flats, Dorset Street and Manchester Street; Davis Estates, Ltd., 346, Kilburn High Road, N.W.6.

STEPNEY.—Dwellings (162), in four blocks, Sidney Street scheme; Gleeds, architects, 106, Regent Street, W.1.

Longbenton.—Houses (48), Crossley Terrace; A. E. Sweetman, U.D.C. surveyor.

Manchester.—Nurses' home for Victoria Memorial Jewish Hospital (£45,500); T. Duffy, architect to Manchester Regional Hospital Board, Sunlight House, Quay Street, Manchester, 3.

Erection of Woodhouse Lane Primary School for E.C.; Integrated Constructions, Ltd., London.

Mitcham.—Works extensions; Thomas Parsons & Sons, Ltd., Church Road.

Morden (Surrey).—Milk depot (£200,000) for Express Dairy Co., Ltd.; Tersons, Ltd., builders, 1, Seward Street, London, E.C.1.

Otley.—Houses (33), Weston Lane estate; borough surveyor.

Plymouth.—School at Whitleigh; Louis de Soissons and Partners, architects, 5, Portland Square.

Pudsey.—Houses (42), Southroyd Park; borough surveyor.

Sunderland.—Mental health occupational centre and offices (£20,000); borough architect.

Warrington.—Health clinic at Garven Place (£19,000); borough engineer.

Whitby.—County modern school for North Riding C.C.; A. Graham Henderson, architect, 196, West Regent Street, Glasgow.

Workington.—County grammar school on site near Stainburn Road (£168,000); county architect, 15, Portland Square, Carlisle.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following :—

" Fit-all " pencil type elements.

" Umberton " busbar system.

Address of Portland Products, Ltd.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

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CLASSIFIED ADVERTISEMENTS

These should be addressed to CLASSIFIED ADVERTISEMENT DEPARTMENT, Dorset House, Stamford Street, London, S.E.1.
CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 7 words) per insertion. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-.
DISPLAYED:- 42/- per inch, per insertion.
Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.
SITUATIONS WANTED:- Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.
REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1., but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ORIGINAL TESTIMONIALS SHOULD NOT BE SENT WITH APPLICATIONS FOR EMPLOYMENT.

OFFICIAL NOTICES, ETC.

STATE ELECTRICITY COMMISSION OF VICTORIA
28-32, William Street, Melbourne, Victoria, Australia.
The Commission is inviting tenders for the supply of Steel and Timber Lifting Masts in accordance with Specifications No. 50/51/80 and A.7 Contract Conditions. Full particulars are available from the offices of the Agent-General for Victoria in London. Tenders, endorsed "Tender to Specification No. 50-51/80" together with a preliminary deposit of £10, are returnable by 11 a.m. on Wednesday, 27th September, 1950. The Commission does not bind itself to accept the lowest or any tender. 4986

COUNTY BOROUGH OF BLACKBURN.
Electric Street Lighting, Whitebirk Road.
Tenders are invited for the installation of street lighting in Whitebirk Road, Blackburn. Tender form, plan and specification may be obtained from the Borough Engineer, Town Hall, Blackburn to whom tenders should be returned not later than September 21st,
Chas. S. Robinson. Town Clerk.
5098

METROPOLITAN BOROUGH OF STEPNEY.
INSTALLATION OF ELECTRIC LIGHTING, HEATING AND POWER, ETC., AT THE 145 DWELLINGS IN FLATS AND HOUSES TO BE ERECTED AT THE BANCROFT ROAD HOUSING SCHEME (SECOND PORTION).
Contract No. 689.
Notice is hereby given that the Council of the Metropolitan Borough of Stepney will receive TENDERS from such persons as may be willing to enter into a contract for providing all necessary labour and materials required for the installation of the Electric Lighting, Heating and Power Points at the above mentioned Housing Scheme. The House of Commons Fair Wages Clause will apply. Contractors will be prohibited from assigning or underletting their contract without the written consent of the Council previously obtained.
The drawings and documents are to be inspected at the Council's offices, by persons desirous of submitting tenders, prior to making the deposit hereunder, in order to satisfy themselves that they can undertake the work. Copies of Stipulations (including Form of Tender), Schedules, Specifications and plans of the buildings may be obtained upon application to A.A.Hudson, Esq., A.M.Inst. C.E., A.R.I.C.S., M.I.Mun.E., A.M.I. Struct.E., A.M.T.P.I., Borough Engineer & Surveyor, Municipal Offices, Duval Street, E.1., upon payment of a deposit of £5, which will be refunded to bona-fide tenderers (subject to the return of all plans and documents issued). Tenders and documents, etc., sealed in the envelopes supplied, must be forwarded to the undersigned, so as to arrive at this office not later than SATURDAY, the 7th OCTOBER, 1950. The Council do not bind themselves to accept the lowest or any Tender, and the acceptance of a Tender or Tenders will be subject to the obtaining by the Council of any requisite consents. By Order of the Council.
J.E. Arnold James, Town Clerk.
Municipal Offices, London Fruit Exchange, Duval Street, E.1.
13th September, 1950. 5215.

CITY OF PETERBOROUGH.
CROWN STREET HOUSING ESTATE. ELECTRICAL INSTALLATIONS.
The Council invites tenders from recognised Electrical Contractors for the electric lighting and power installations to 86 Permanent Houses on the Crown St. Estate, Peterborough. Drawings, specifications and forms of tender may be obtained on application to F.J. Smith, M.B.E., A.M.I.C.E., City Engineer & Surveyor, Town Hall, Peterborough. Applications for the above documents should be made before noon on 22nd September, 1950, and should be accompanied by a cheque to the value of £2.2s.Od, made payable to the Peterborough City Council, which will be returned on receipt of a bona-fide tender or the return of the documents. The Council does not bind itself to accept the lowest or any tender.
C. Peter Clarke, Town Clerk
Town Hall, Peterborough.
4th September, 1950.

SITUATIONS VACANT.

WALSALL EDUCATION COMMITTEE.
WALSALL TECHNICAL COLLEGE.
Applications are invited for the following post:-
(i) ASSISTANT LECTURER IN ELECTRICAL ENGINEERING. Ability to teach the Theory and Practice of Electrical Installation Work for City and Guilds Course B and C will be considered an advantage.
(ii) ASSISTANT LECTURER IN MECHANICAL ENGINEERING. Salary for each post will be in accordance with Burnham Technical Scale. Further particulars and application forms may be obtained from the Principal, Walsall Technical College, Bradford Place, Walsall.
V.J.Moore, Director of Education.
5101.

AUSTRALIA.
TOWNSVILLE REGIONAL ELECTRICITY BOARD - QUEENSLAND.
Applications are invited for the position of MANAGER of the above Board. Applicants must have had considerable administrative experience in the control, management, and development of electricity supply undertakings operating on a reasonably large scale, and should preferably have had corresponding technical experience and be Members of a recognised Institution of Electrical Engineers, or similar body. The Salary range is £1,200 to £1,650 (Australian) subject to cost of living adjustment and the successful applicant may be appointed at any salary within that range depending on his qualifications and experience. Applications, suitably endorsed, should contain full particulars of training, experience, degrees, diplomas, positions held and degree of responsibility, age, marital state and war service, if any, should be accompanied by copies of credentials, and should be received by the Secretary, The State Electricity Commission, G.P.O. Box 10A, Brisbane, Queensland, not later than 23rd September, 1950. Further particulars may be obtained from the undersigned:-
M. McAully,
Acting Agent-General for Queensland,
409, Strand, London, W.C.2. 5085.

AIR MINISTRY.
STATION ENGINEERS.
There are vacancies for Station Engineers in the Directorate General of Works at R.A.F. Stations in the provinces. The Salary of this grade rises to a maximum of £525 a year and starting pay will depend upon age, experience and qualifications. Annual increases will be granted for satisfactory service where salary is below the maximum. The appointments are temporary but have long term possibilities and a scheme is in course of preparation to fill permanent pensionable appointments. Candidates should normally be below 50 years of age and should be natural born British subjects and possess the following qualifications:- National Certificate in Electrical and/or Mechanical Engineering, or equivalent technical educational standard together with equivalent of five years apprenticeship with an engineering concern and have gained a good comprehensive training. In addition to have either:-
(a) a minimum of three years with an engineering concern and have gained a good comprehensive experience, or
(b) to have acted as a supervisor of labour, chargehand or technical officer in the engineering industry.
Consideration will, however, be given to candidates who while not conforming strictly to the requirements stated above, nevertheless have had comparable training and experience. Appointments to locations at or nearest to those specified in applications will be arranged as far as possible. Application stating age, qualifications and all previous appointments to be addressed to the Under Secretary of State, Air Ministry, S.2. (h), Cornwall House, Stamford Street, S.E.1. 5065

BRITISH ELECTRICITY AUTHORITY.
YORKSHIRE DIVISION.
STATION CHEMIST - BRADFORD POWER STATION
Applications are invited for the position of STATION CHEMIST at the Bradford Power Station. Applicants should preferably hold a University Degree in Chemistry, or equivalent qualification, but consideration will be given to those holding the Higher National Certificate in Chemistry, who are pursuing a recognised course of study with a view to final qualification. Previous experience of modern power station practice involving the chemical control of feed and boiler waters for boilers operating at 600 p.s.i., fuel sampling, testing and analysis, and the testing of lubricating and insulating oils is desirable. A knowledge of the problems associated with condenser fouling and external boiler deposits would be an advantage. Conditions of service and salary will be in accordance with the revised N.J.B. Schedule, Grade 8, Class C, £607 - £631 per annum, which should be regarded as provisional and subject to determination by the appropriate organisations. The appointment will be subject to the provisions of the Authority's Superannuation Scheme. Applications must be made on forms obtainable from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement. Envelopes should be endorsed "Station Chemist".
G.A.Fowles. Divisional Controller.
5086

WOOLWICH POLYTECHNIC. S.E.18.
The Governing Body invite applications for the post of LECTURER in the Electrical Engineering Department. The work of the Department includes the preparation

of internal students for the degree of B.Sc. (Eng.) and also for Ordinary and Higher National Certificates. Burnham Technical Scale between £336 - £708 depending on qualifications, training and experience. Full particulars of the post and application form may be obtained from the Clerk to the Governors, to whom they should be returned within two weeks from the date of this advertisement.

5103.

SOUTH WALES ELECTRICITY BOARD.
WEST CENTRAL SUB-AREA.
Applications are invited for the positions of LINESMEN (Overhead Power) on the establishment of Sub-Area Engineer and based at Dulais Depot, Pontardulais, Near Swansea. The duties will include the carrying out of all work in connection with the erection and maintenance of Overhead Transmission, Distribution, Service and Street Lighting Lines and any equipment and apparatus in connection therewith, of which duties applicants should have had good experience. The conditions of employment applicable to these appointments are as laid down by the National Joint Industrial Council for the Electricity Supply Industry, the present rate of pay for a 44-hour 5 day week being 2/10d. per hour. Applications should be addressed to the Undersigned within 14 days of the publication of this advertisement.
G.R.T. Edwards. Sub-Area Manager,
Ystrad Road, Fforestfach, Swansea.
30th August, 1950. 5106

EASTERN ELECTRICITY BOARD.
CHIEF COMMERCIAL OFFICERS DEPARTMENT.
APPOINTMENT OF ASSISTANT COMMERCIAL ENGINEER - BOARD HEADQUARTERS.
Applications are invited for the appointment of ASSISTANT COMMERCIAL ENGINEER at the Board's Headquarters, Wherstead. The successful applicant will be required to assist a Section Head and his previous experience should include all forms of utilisation for domestic, commercial, industrial and agricultural consumers, the negotiation of street lighting contracts, the preparation and operation of hire purchase and other promotional schemes and the general administration of the commercial side of the industry. The salary will be in accordance with Grade 2, Class AX of the National Joint Board Agreement, i.e. £752 - £884 per annum, and will commence at a step in that grade commensurate with qualifications and experience. Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies. The successful applicant will be required to contribute to a Superannuation Scheme and may have to undergo a medical examination. Applications should be addressed to, The Chief Commercial Officer, Eastern Electricity Board, Wherstead, near Ipswich, so as to reach him within fourteen days of the appearance of this advertisement.

5109.

LONDON ELECTRICITY BOARD.
COMMERCIAL STAFF.
Applications are invited for the following positions in several Districts of North West London.
(a) DEVELOPMENT ASSISTANTS. Applicants are required to have a knowledge of service to consumers, tariffs and their application. They should be familiar with electrical apparatus and be capable of advising consumers on domestic and small commercial and industrial installations.
(b) SENIOR DEVELOPMENT ASSISTANTS. Applicants are required to have a sound knowledge of all aspects of service to consumers and be capable of planning and estimating for domestic, commercial and small industrial installations.
They should possess a good knowledge of electrical apparatus and the basic principals of tariffs and their application. Preference will be given to applicants possessing the Ordinary National Certificate in Electrical Engineering. These posts are graded within the permanent agreement of the National Joint Council (Administrative & Clerical Grades), as follows: Development Assistant:- Grade 1 i.e. £310 to £390 per annum, plus the appropriate London Area Allowance. Senior Development Assistant:- Grade 2, i.e. £390 to £450 per annum, plus the appropriate London Area Allowance. Application forms obtainable from Establishments Officer, 46, New Broad Street, E.C.2. on receipt of addressed foolscap envelope. Please quote ref. EST/V/836/7/R. on envelope and all correspondence.

5104

CROWN AGENTS FOR THE COLONIES.
CHARGE SHIFT ENGINEER required by the Nigeria Government Electricity Undertakings for two tours each of 18 to 24 months with prospect of permanency. Commencing salary according to age and experience in the scale £711 rising to £1157 a year, including expatriation pay and temporary increase. Outfit allowance £30 or £60 according to salary. Free passages for the officer and his wife and assistance towards the cost of children's passages. Liberal leave on full salary. Candidates under 45 years of age must have served an apprenticeship to mechanical engineering and hold a 1st Class B.O.T. Certificate (with Diesel endorsement) or the quivalent. They must have had good practical experience in the operation and maintenance of water tube boilers, steam turbines, reciprocating steam and internal combustion engined generating plant and gas producers. Apply at once by letter, stating age, full names in block letters, whether married or single, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. quoting M/M/25628(3B) on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration.

5111.

BRITISH ELECTRICITY AUTHORITY.
SOUTH WALES DIVISION.
Applications are invited for the following appointments at the Uskmouth Generating Station Site, near Newport:-
(a) ASSISTANT QUANTITY SURVEYOR, at a salary within the range £500 to £600 per annum.
(b) SITE MEASURING CLERK, at a salary within the range £390 to £450 per annum.
Both appointments will be temporary for a period of approximately two years and the salaries, which are provisional and subject to negotiation through the appropriate National machinery, will be in accordance with the candidate's age and experience. Applicants for (a) should be capable of checking interim and final measurements in accordance with the priced Bill of Quantities for inclusion in the Contractor's statement, and preference will be given to those who have passed the intermediate examination of an appropriate Professional Institute. Applicants for (b) should be capable of dealing with measurements of large contracts by standard methods. Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than 25th September 1950, in sealed envelope endorsed with the appointment sought.
H.V. Pugh., Divisional Controller,
Cardiff (Pengam Moors) Airport, Cardiff.
29th August 1950. 5107

LONDON ELECTRICITY BOARD.
Applications are invited for the following appointments in the Architect's Section of the Chief Engineer's Department in Central London.
(a) ASSISTANT ARCHITECTS - Commencing salary will be from £650 per annum, dependent upon qualifications and experience. Applicants should preferably be Associate Members of the R.I.B.A. They should be capable of preparing working drawings and specifications and should have had good general experience in design and construction.
(b) ARCHITECTURAL ASSISTANTS - Commencing salary will be from £500 per annum, dependent upon qualifications and experience. Applicants should be studying for or have passed the Intermediate Examination of the R.I.B.A., be capable draughtsmen and have had several years' experience in an Architect's office.
(c) DRAUGHTSMEN - Commencing salary will be from £350 per annum, dependent upon ability and experience. Applicants should be neat draughtsmen and preferably have had several years' experience in an Architect's office. The salaries for the above posts are provisional pending grading of the posts under the National Agreement of the appropriate negotiating body. Application forms, obtainable from Establishments Officer, 46, New Broad Street, E.C.2., on receipt of an addressed foolscap envelope, to be returned duly completed not later than 25th September, 1950. Please mark envelope EST/V/878/R. 5112.

UNIVERSITY OF BRISTOL.
ELECTRICAL ENGINEERING DEPARTMENT.
LABORATORY MECHANIC required. Applicants should have had training and experience in electrical manufacture, preferably with electrical machinery. They should be versatile craftsmen, interested in the construction of experimental equipment in several materials, and used to handling various light machine tools. Initial salary in the range £286 - £390, according to experience. Good working conditions and liberal pension scheme. There are prospects of promotion to senior technician grade(s), after a period of satisfactory service. Apply giving details of age, experience, etc. to the Registrar, The University, Bristol, within 2 weeks of the date of this advertisement. 5175

BRITISH ELECTRICITY AUTHORITY.
NORTH EASTERN DIVISION.
APPOINTMENT OF THIRD ASSISTANT ENGINEERS (SITE MECHANICAL) GENERATION (CONSTRUCTION) DEPARTMENT.
Applications are invited for the position of THIRD ASSISTANT ENGINEERS (Site Mechanical) in the Generation (Construction) Department at North Tees Power Station. Applicants must have successfully completed a recognised course of technical study in Mechanical Engineering and should have had good general Mechanical Engineering Training preferably in association with the construction and operation of large capacity Boiler Plant and Generating Equipment. The salary will be in accordance with Grade 5, Schedule C, of the National Joint Board Agreement (£579 - £753 per annum) and commence at a point commensurate with qualifications and experience. Superannuation will be in accordance with the British Electricity Authority and Area Boards Superannuation Scheme. Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne to whom they should be returned not later than 23rd September, 1950. 5100.

MIDLANDS ELECTRICITY BOARD.
Applications are invited for the position of ACCOUNTANCY ASSISTANT. Possession of the Intermediate Certificate of one of the recognised professional Accountancy Bodies would be an advantage. Salary will be in accordance with the National Joint Council (Grade 3) £450/£510 per annum. The successful applicant will be required to contribute to the Board's Superannuation Scheme if eligible. Applications stating age, education and experience should be forwarded within seven days to:-
T.C. Keeler, Sub-Area Manager,
South Staffs. & North Worcs. Sub-Area.
Midlands Electricity Board,
Toll End Road, Tipton.
A. STEPHENS. SECRETARY.
5164.

SOUTHERN ELECTRICITY BOARD.
NO.3 (PORTSMOUTH) SUB-AREA.
PLANNING ENGINEER, ALDERSHOT DISTRICT.
Applications are invited for the position of PLANNING ENGINEER in the Aldershot District of the No. 3 (Portsmouth) Sub-Area. The salary will be in accordance with the N.J.B. Schedule, Class F, Grade 5 (£711 - £724 - £737), with N.J.B. Conditions of Service. Candidates should have experience in and ability to prepare proposals and estimates for extensions of H.V. and L.V. networks and substations, and to deal with preliminary work prior to construction. The appointment will involve standby duties. The successful applicant will, subject to certain conditions, be required to join the B.E.A. & Area Boards' Superannuation Scheme, membership of which is compulsory. Applications, on forms to be obtained from the Sub-Area Secretary, should be returned to him at Lower Drayton Lane, Cosham, Portsmouth, in envelopes endorsed "Planning Engineer, Portsmouth", within fourteen days of the publication of this advertisement.

F.W.KEMPTON. SECRETARY.

5110.

SOUTHERN ELECTRICITY BOARD.
NO.3. (PORTSMOUTH) SUB-AREA.
PLANNING ENGINEER, PORTSMOUTH DISTRICT.
Applications are invited for the position ofPLANNING ENGINEER in the Portsmouth District of the No.3 (Portsmouth) Sub-Area. The salary will be in accordance with the N.J.B. Schedule, Class F. Grade 5 (£711-£724-£737), with N.J.B. Conditions of Service. Candidates should have experience in and ability to prepare proposals and estimates for extensions of H.V. and L.V. networks and substations, and to deal with preliminary work prior to construction. The appointment will involve standby duties. The successful applicant will, subject to certain conditions, be required to join the B.E.A. & Area Board' Superannuation Scheme, membership of which is compulsory. Applications, on forms to be obtained from the Sub-Area Secretary, should be returned to him at Lower Drayton Lane, Cosham Portsmouth, in envelopes endorsed "Planning Engineer, Portsmouth", within fourteen days of the publication of this advertisement.

F.W. KEMPTON. SECRETARY. 5105

SOUTH WESTERN ELECTRICITY BOARD.
Applications are invited for the following positions in the Bristol Sub Area Accountant's Department with Headquarters at Bristol:- Experience in the Electricity Supply Industry of punched-card accounting methods, and the possession of a recognised accountancy qualification will be advantageous.
1. PRINCIPAL ASSISTANT - FINAL ACCOUNTS.
Applicants should have had a sound knowledge of accountancy and be capable of controlling staff. The successful candidate will be responsible for all aspects of financial accounting in the Sub-Area; including the preparation of revenue and capital estimates, budgetary control of expenditure, periodical financial returns and final accounts. The commencing salary will be within Grade 7 (£705 x 30 to £795 p.a.) of the N.J.C. Salary Agreement for the Electricity Supply Industry.
2. PRINCIPAL ASSISTANT - STORES & INVOICES
Applicants should have had considerable stores accounting experience and be capable of supervising staff. The successful candidate will be responsible for stores accounting and control, and will be required to organise a system of stores records. The commencing salary will be within Grade 7 (£705 x 30 to £795 p.a.) of the N.J.C. Salary Agreement.
3. PRINCIPAL ASSISTANT - WAGES AND PERSONNEL RECORDS.
Applicants should have had considerable experience of this class of work and have a sound knowledge of the National Insurance Acts. The successful candidate will be required to take control of the Wages Office, personnel records and the allocation of wages and salaries for cost and financial accounts. The commencing salary will be within Grade 6 (£630 x 25 to £705 p.a.) of the N.J.C. Salary Agreement. Applications giving full details, including age, qualifications, experience and present salary and indicating for which post(s) candidates desire to be considered, should be submitted to Sub Area Manager, Bristol Sub Area, South Western Electricity Board, Electricity House, Bristol. 1. within ten days.

5165

BRITISH ELECTRICITY AUTHORITY.
GENERAL ASSISTANT ENGINEER.
RESEARCH BRANCH, CHIEF ENGINEER'S DEPT., HEADQUARTERS.
Applications are invited for the appointment of a GENERAL ASSISTANT ENGINEER in the Electro-Technical Research Section of the Research Branch in London. The salary for the appointment, which is superannuable, will be within the Scale £490-£624 per annum according to qualifications and experience, rising ultimately to a maximum of £689 per annum including London Allowance in accordance with Grade 5 of the N.J.B. Agreement. Candidates should possess a First or Second Class Honours Degree in Engineering or Physics and preference will be given to those with some Research experience or knowledge of a branch of power transmission engineering. Duties will include investigations and measurements in the field concerning damage due to corrosion and lighting. The successful candidate may be required to pass a medical examination. Application Forms may be obtained from the Secretary's Office (Establishments), Applications Section, British Electricity Authority, British Electricity House, Great Portland Street, London, W.1. and should be completed and returned to D.Moffat, Director of Establishments, not later than 30th September 1950. Please quote reference "A.E.91". 5166

BRITISH ELECTRICITY AUTHORITY.
FEMALE TRACERS.
DRAWING OFFICE.
CHIEF ENGINEER'S DEPARTMENT - LONDON.
Applications are invited for vacancies in the Drawing Office of the Chief Engineer's Department at Headquarters in London for FEMALE TRACERS. The starting salary for the appointments, which are superannuable, will be within the General Clerical Grade of the National Joint Council ranging from £123 per annum at age 16 and rising by annual increments to £278 per annum at 26 and to an ultimate maximum of £338 per annum, including London Allowance in each case. Application forms may be obtained from D.Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1., and should be completed and returned to him not later than 2nd October, 1950. Please quote reference AE/94.
5176

CENTRAL GLOUCESTERSHIRE SUB-AREA.
ASSISTANT CONSUMERS' ENGINEER.
CHELTENHAM DISTRICT.
Applications are invited for the above post in the Cheltenham District of the Central Gloucestershire Sub-Area.
Applicants should have had a sound technical and practical training and experience in all branches of distribution work, negotiations with domestic, commercial, agricultural and industrial consumers, and planning and supervision of practical work. Appropriate technical qualifications will be considered an advantage. The appointment will be in accordance with N.J.B. conditions, and the salary will be Class "D", Grade 10, £465 per year. It is possible that the district will enter Class "E" in the next financial year. Applications, stating age, education, qualifications, and experience, should be forwarded within 14 days to Mr. D. Holt, Manager, Central Gloucestershire Sub-Area, Midlands Electricity Board, 126 London Road, Gloucester. 5191.

BRITISH ELECTRICITY AUTHORITY.
SENIOR DRAUGHTSMEN.
CHIEF ENGINEER'S DEPARTMENT - LONDON.
Applications are invited for vacancies in the Drawing Office of the Chief Engineer's Department at Headquarters in London for SENIOR DRAUGHTSMEN, Grades A and B, with experience on Power Station Layout, or on the Layout of Plant connected with Power Stations. The starting salaries for the appointments, which are superannuable, will be determined according to age and experience within the following provisional ranges; Grade A £500 to £600 per annum; Grade B £600 to £700 per annum. Application forms may be obtained from D.Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London, W.1., and should be completed and returned to him not later than 2nd October, 1950. Please quote reference AE/95. 5177

SOUTH WEST SCOTLAND ELECTRICITY BOARD.
AYRSHIRE SUB-AREA.
APPOINTMENT OF ASSISTANT DISTRICT ENGINEERS.
Applications are invited for the posts of THIRD ASSISTANT DISTRICT ENGINEERS - Grade S Class 'B' - £550/560 per annum Grade S Class 'C' - £494/514 per annum of the National Joint Board agreement. Candidates should possess technical qualifications to the standard of the Higher National Certificate or its equivalent, and should have had a sound practical training and experience in the operation and maintenance of large distribution systems, preference being given to those candidates experienced in systems operating up to 33 kV. The salaries stated above will be subject to any deductions in respect of income tax and superannuation. Applications stating age, details of education, qualifications, experience, present position, whether married or single, to be sent to the undersigned within fourteen days of the appearance of this notice.
A.E. Roots, Manager,
Greenholm Street, Kilmarnock.
31st August, 1950. 5102.

MINISTRY OF WORKS.
ENGINEERING DRAUGHTSMEN are required in London, Windscale (Cumberland) and at Risley (Warrington), for duty in the Drawing Office. Although the posts are not established, they have long-term possibilities and competitions are held periodically to fill established vacancies London Salary: £300 p.a. at age 21, with £20 additional for each year above up to a maximum of £525 p.a. Salary in provinces is slightly lower. Hostel Accommodation for men is available at Risley and Windscale. Applicants should be of British birth, and have experience in one of the following categories:-
(a) Mechanical, General mechanical engineering, particularly heavy plant, steam generation, pumping including pipeline installations and pressure vessel design.
(b) Electrical, Electrical Installations, lighting and power for all types of buildings, overhead and underground distribution systems, the installation of all types of electrical equipment, instrumentation and controls.
(c) Heating and/or Ventilating. The design of all types of heating and/or ventilating systems and general domestic engineering installations for all classes of buildings.
Candidates should have reached a technical standard of not less than Ordinary National Certificate. They are expected to have had apprenticeship or suitable technical training, and to have served not less than 3 years in a Drawing Office. Apply in writing, stating locality preferred, age, and full details of training and experience, quoting reference W.G.10/BB, to Chief Engineer W.G.10/BB, Ministry of Works, John Islip Street, London, S.W.1. 4355.

MIDLANDS ELECTRICITY BOARD.
Applications are invited for the appointment of COMMERCIAL ASSISTANT (Tariffs and Statistics). Duties will consist of the preparation and study of Revenue Estimates and of commercial and load statistics, preparing recommendations on supplies requiring special terms, including power and public lighting and the study and coordination of tariff matters. Previous experience in similar duties will be an advantage. The salary and conditions of service will be in accordance with Grade 4 of the National Joint Council (Administrative and Clerical Grade) for the Electricity Supply Industry i.e. £510/£570 per annum. The successful applicant will be required to contribute to the Board's Superannuation Scheme if eligible. Applications stating details of age, qualifications, experience and present post should be forwarded with 14 days to:-
H.A.P. Caddell, Manager,
North Staffs. Sub-Area,
31, Kingsway, Stoke-on-Trent.
A. STEPHENS. SECRETARY.
5192.

MIDLANDS ELECTRICITY BOARD.
WOLVERHAMPTON AND DISTRICT SUB-AREA.
APPOINTMENT OF ASST. CONSUMERS ENGINEER.
Applications are invited for the above position in the Walsall District of the Wolverhampton and District Sub-Area. Applicants should have had a sound technical training with practical experience in the sale and installation of domestic and commercial electrical equipment and the wiring associated therewith. The duties would include the supervision of contracting work, advising consumers in respect of new supplies, extensions and alterations and estimating for same. Appropriate technical qualifications will be considered an advantage. The appointment will be in accordance with N.J.B. conditions and the provisional salary subject to negotiation will be £538 per annum. Applications stating age, experience, and present salary should be forwarded within fourteen days to:-
F.J. Elliott, Manager,
Midlands Electricity Board,
Wolverhampton & District Sub-Area,
85, Darlington Street, Wolverhampton.
A. STEPHENS. SECRETARY.
5216

AUCKLAND ELECTRIC POWER BOARD.
NEW ZEALAND.
ASSISTANT ENGINEER.
Applications are invited for the appointment of ASSISTANT ENGINEER, Auckland Electric Power Board. Candidates must be British subjects, not over 40 years of age and hold an approved University Degree in Electrical Engineering or be Corporate Members of the Institution of Electrical Engineers, and have experience in an Electricity Supply Undertaking in the design, construction and maintenance of overhead distribution systems up to 11 kV and underground cable systems up to 22kV. The salary of the appointment will be at the rate of N.Z. £685. per annum increasing to N.Z. £835 per annum by three annual increments of N.Z. £50. The above salary is subject to a cost of living bonus of 7/- per week. Passages at tourist class rates will be paid for by the Board for the officer and his family up to four persons in all. Applications endorsed "Assistant Engineer" Auckland" giving full particulars of qualifications and experience, references age, married or single, children, and when available must reach the undersigned by or before the 25th September, 1950.
Preece, Cardew & Rider,
8-10, Queen Anne's Gate, Westminster,
London, S.W.1. 5113.

COUNTY COUNCIL OF THE COUNTY OF LANARK.
LIGHTING DEPARTMENT.
Applications are invited from suitably qualified persons for the post of "Junior Technical Assistant" in the County Lighting Engineer's Office. The salary applicable to the post will be in the Grade A.P.T. I. (£390 - £435). Candidates must have had a sound technical training and practical experience in electrical engineering and be a neat draughtsman, capable of completing final drawings from working plans.
Applicants with a knowledge of overhead and underground distribution will be preferred. The post is superannuable and the successful candidate will require to pass a medical examination. Canvassing directly or indirectly will be a disqualification. Forms of application may be obtained from the County Lighting Engineer, 15 Clydesdale Street, Hamilton, Lanarkshire, and must be returned to him not later than Monday, 23rd September, 1950.
WM. C. BROWNLIE. COUNTY CLERK
Lanarkshire House, 191 Ingram Street,
Glasgow, C.1.
29th August, 1950.

MIDLANDS ELECTRICITY BOARD.
Applications are invited for the positin of DEMONSTRATOR. Applicants must have had a good general education and the possession of a recognised Diploma in Domestic Science and Electrical Housecraft will be an advantage. Candidates must be able to conduct lecture demonstrations both in the showrooms and on consumers' premises, and to advise consumers on the selection and use of electrical apparatus. Salary and conditions of service will be in accordance with the National Joint Council Grade 1 within the range of £310 - £350 per annum with further progress to £390 dependent upon a certificate of capability. The successful applicant will be required to contribute to the Board's Superannuation Scheme, if eligible. Applications stating age, education, qualifications details of training and subsequent experience should be forwarded within fourteen days:
J.H. Davies, District Manager,
Midlands Electricity Board,
15/17, Bridge Street, Banbury.
A.STEPHENS, SECRETARY.
5163.

BRITISH ELECTRICITY AUTHORITY.
LONDON DIVISION.
Applications are invited for the following vacancies in the SYSTEM OPERATION DEPARTMENT at St. Paul's Grid Control Area:-
(i) FIRST ASSISTANT CONTROL ENGINEER.
(ii) GENERAL ASSISTANT ENGINEERS.
Applicants should have had practical training and have technical qualifications up to Graduate I.E.E. standard. The commencing basic salary for (i) will be within the range £579.0.0. rising to £710.0.0. and for (ii) £437.0.0. rising to £569.0.0. To both will be added a London Allowance of 5% with a minimum of £25. per annum. These salaries are in accordance with Class AX grades 5 and 8 respectively of the N.J.B. Schedule and are subject to an ultimate maximum in Class EX for (i) of £799 and for (ii) of £641 plus 5% London Allowance in each case. Applications for the foregoing vacancies stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1., to be received within fourteen days of the appearance of this advertisement.
J.N. WAITE. DIVISIONAL CONTROLLER.
5209

BRITISH ELECTRICITY AUTHORITY.
LANDS OFFICER.
LANDS ACQUISITION DIVISION, SECRETARY'S OFFICE, HEADQUARTERS LONDON.
THE BRITISH ELECTRICITY AUTHORITY wish to appoint a LANDS OFFICER in the Lands Acquisition Division of the Secretary's Office at their Headquarters in London. The appointment, which is permanent and superannuable, will be made within the provisional salary range of £900 to £1,250 per annum. Applicants should have administrative or executive experience and, preferably, some knowledge of transactions in real estate and Town and Country Planning legislation. Applicants should state their age, qualifications, experience and present salary, and give the names of two persons to whom reference may be made as to professional ability and character. Letters of application, which will be acknowledged and treated as confidential, should be sent to D.Moffat, Director of Establishments, British Electricity House, Great Portland Street, London, W.1., so as to be received not later than 22nd September, 1950. Please mark top left hand corner of envelope AE/96. 5169.

A large firm of manufacturing electrical engineers in the Midlands have a vacancy for an experienced engineer for the design of industrial control gear apparatus, including all types of contactors, starters, regulators etc., Education up to B.Sc. standard would be an advantage and some experience of design for quantity production desirable. Full particulars to Box No. 5091.

A GENERAL/WORKS manager small factory(S. Coast); Cable jointers & foreman (Home & Overseas); Progress chasers;Development engineer Fluorescent street lighting; Lighting sales engineer; Radio/Television testers, inspectors, wiremen,also trainees; Service engineers Radar Radio, Television; fitters; Telephone engineers & mechanics; Transformer test engineers; Instrument mechanics; Planning/Production engineers; Ratefixers; other positions vacant;- Technical Employment Agency, 179, Clapham Road S. W. 9. (Brixton 3487)

AIR MINISTRY have vacancies for designers/ draughtsmen in the designs branch of the works department for high-class work in the following fields;Mechanical and electrical engineering. The work includes designs for London Airport.Appointments will be to specific locations, including London, without liability for subsequent transfer. Salaries are on ranges up to £750. Starting pay according to age and qualifications.-Applications, stating age, qualifications, previous appointments and salary required, should be sent to Air Ministry, S.2(h). Cornwall House, London, S.E.1. It is regretted that applications of candidates not called for interview cannot be acknowledged. 4837

ALLIANCE Electrical Co., Ltd., 2, Henrietta Street, W. C. 2. are prepared to consider training a few youths of good education in all branches of Electrical contracting. Write for appointment. 5128

ASSISTANT electrical engineer required for British company operating public utilities in Khartoum, Sudan. Candidates who should be under 40 and well qualified technically must have had experience in a responsible capacity in the operation and maintenance of modern substation equipment and overhead and underground mains with an electricity supply undertaking. Emoluments from £E,760 to £E1,012 depending on qualifications and experience and whether married and number of children. Liberal leave, free passages and house.- Write giving full particulars of experience including types and makes of plant and equipment with which most familiar, mentioning reference 774A to Box 5026.

ASSISTANT required for Telephone Circuit Laboratory in London District. Experience of maintenance or design of C.B. and Auto Exchange equipment desirable. Apply stating qualifications, age and experience to Personnel Department, Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich,S.E.21.(Tel:Gipsy Hill 2211) 5088

BUYER, not over 40, required for developing light electro-mechanical engineering company in Northern England. Only those prepared for a time to subordinate their personal convenience to the job, need apply. House available Box No.5129

BELLING & LEE Ltd. Cambridge,Arterial Rd. Enfield, Middlesex, have the following vacancies; (1) Assistant for research and development work in connection with fuses and thermostats. (2) Assistant for research and development in connection with radio aerials, Components and interference suppressors. Applicants must be at least 21 years of age and be graduate members of the I.E.E. or hold equivalent qualifications; some experience laboratory or measurement experience is essential. Applications to give details of education and experience and state salary required. 10w

CABLE Sales engineer required for Midland Area to develop sales of Rubber Insulated Cables. Applicants must have an intimate knowledge of Rubber Cables, and preferably a good connection with Commercial, Industrial Electricity Supply and Municipal Undertakings. Applications giving details of experience, age, and salary required should be sent to:- Mersey Cable Works Limited, Linacre Lane Bootle, Liverpool, 20.

CHARGEHAND Electricians required by London (W.C.2.) Contractors. Only men capable taking charge contracts need apply. Permanent position for good men. Write details experience.- Box No. 5126.

CIVIL Engineers - A number of vacancies occur for Assistant Site Engineers for railway electrification Contracts, initially in the Manchester/Sheffield area but with the probability of overseas work later. Duties include surveying, erection of structures and of overhead line equipment. Candidates should be Civil or Electrical Engineering graduates, preferably with 2/3 years, post graduate experience, but this is not essential. Age range approximately 22/26 years. Salary according to age, experience and qualifications. Applications should be addressed to the Staff Officer, British Insulated Callender's Cables Ltd. Prescot, Lancashire. 5146.

CLERK for order correspondence, etc. required. Must have experience of Electrical Trade. Applications with full details and salary required to The Manager, Thermovent Heating, E.K. Cole Ltd., 8, Vigo St. London, W.1. 50w5.

CONTRACTS Engineers are required by the Brush Electrical Engineering Co. Ltd. for the Electrical Machines, Switchgear, Turbine and Transformer Divisions. Applicants should possess at least a Higher National Certificate in Electrical or Mechanical Engineering, have served a full apprenticeship and must be fully conversant with the product to which their application relates. Applicants for the Switchgear Division must be capable of preparing specifications for a variety of Switchgear up to 22kV. Salary according to age and qualifications. These positions are of a permanent character and have prospects. A full scale superannuation scheme is in operation. Apply in first instance by letter to - Central Labour Dept., Loughborough. 5071

CONTROL Engineers for network operation required by major oil company in Middle East for control centre covering operation of extensive overhead and underground transmission and distribution networks up to 66kv. Applicants must possess Ordinary or Higher National Certificate in Electrical Engineering, and must be experienced in the operation of indoor and outdoor metal-clad switchgear at all voltages, transformers and associated substation equipment. Age not over 35. Attractive salary plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements, pension scheme.- Write giving personal particulars and details of qualifications and experience, quoting Department P.116 to Box 2583, at 191, Gresham House, E.C.2 193

DESIGN Draughtsman (Senior) required by an Electrical Engineering Company. Applicants should have specialist experience in the design of either F.H.P. Industrial Motors or Flameproof Gear. The appointment offers considerable scope to a person with ambition. Applicants should write stating previous appointments held and salary required to Personnel Department, Newman Industries Limited, Yate, Bristol. 5143

DESIGNER (Senior) to take charge of Electrical D.O. Applicants must have had experience in similar position and with particular knowledge of both A.C. and D.C. Machines from ¼ to 25 H.P. Write stating age, qualifications experience and salary, to Personnel Manager, Tilling Stevens Ltd. Victoria Works, Maidstone, Kent. 50w3.

DRAUGHTSMAN Age 22/23 for detailing small mechanism. Interesting work. Good conditions. Write giving full details of experience etc. to Box No.5130.

DRAUGHTSMAN/ENGINEER required as Assistant in Engineering Department. Must have served apprenticeship on small electrical indicating instruments, and have some technical knowledge. Very good opportunity for young man with initiative. Write giving full details to Box No.5133

DRAUGHTSMEN of Senior, Intermediate and Junior Grades are required at Stafford by the English Electric Co. for the design and detail of heavy electrical rotating machines from 200hp upwards, including largest types of water and steam driven alternators and mill motors, and for heavy duty steel tank mercury arc rectifiers. Permanent appointment, pension scheme, hostel accommodation. Tenancies of houses allocated by the company will be discussed with successful married applicants, having at least one child. Please apply quoting Ref.74 to Central Personnel Service, English Electric Co. Ltd., 24-30, Gillingham St., London, S.W.1 4851

DRAUGHTSMEN, Senior & Junior, required by Manufacturers of Electrical Motors. House provided. State age, Salary, Experience to Box No. 5137.

DRAUGHTSMEN, Senior and Junior, for design and development of domestic and heavy duty cooking, heating and kindred appliances. Salary in accordance with qualifications. Birmingham district.- Box 5003.

ELECTRICAL draughtsman required by major oil company for service in the Middle East. Must have served five years' electrical engineering apprenticeship and have had five years' D.O. experience in connection with electric layouts of large industrial plants with underground cabel networks. Should possess Higher National Certificate. Graduate or Associate membership of a corporate engineering body desirable but not essential. Maximum age limit 35 years. Attractive salary plus generous allowance in local currency. Free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension scheme Write giving personal particulars and details of qualifications and experience quoting Dept.F.192 to Box 2810 at 191, Gresham House, Old Broad St.,E.C.2.Applicants without above requirements will not be considered. 195

ELECTRICAL Engineers or Physicists required with experience in the theory and practice of servo mechanisms and analogue computors for interesting new development work near London.- Apply, mentioning Ref.D.E.F. to Box 4889.

ELECTRICAL Engineer wanted for sales office of manufacturer, outside London, making large resistors for motor control gear, to handle enquiries and application design.- Full particulars to Box No. 5051.

ELECTRICANS with general contractors' experience; local work; permanent position to good men.- Apply Knight's (Hendon) Ltd., 42, Watford Way.N.W.4.133

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ENGINEERS and Technicians required for training in the installation of Auto. Telephone Exchange Equipments; 24 to 30 years of age, must be willing to travel and work in any part of the U.K. A knowledge of electricity is essential. Excellent prospects. Apply, stating experience and technical qualifications to;- Siemens Bros. & Co., Ltd., Reference 427 Woolwich, London, S.E. 18. 5073

ENGINEER and Manager for Electrical Contractor's business London. Must have held similar position. Capable estimating, supervising, interviewing. Applications strictly confidential. Commencing salary £1,000 with prospects. Write stating age, qualifications, experience and copies of testimonials. Box No.452, Dorland Advertising Ltd., 18, Regent Street, London, S.W.1. 9067.

ENGLISH ELECTRIC, Stafford, require electrical engineers of at least H.N.C. standard to operate and interpret results in a new section operating an a.c. network analyser; preference will be given to applicants with a good mathematical background who have served a recognised engineering apprenticeship and who have a sound appreciation of the operation of power systems. - Apply, quoting reference 473 to Central Personnel Services,English Electric Co. Ltd. 24-30, Gillingham St. London, S.W.1. 5007.

ENGLISH ELECTRIC, Stafford, invite applications from young engineers who are interested in relay and meter design; previous experience desirable, but not essential; qualifications, honours degree in electrical engineering with bias towards mathematical aspect; facilities exist for giving chosen applicants a thorough education in the design and development of meters and relays, with assurance of stability of employment and ideal working conditions; apply giving full details quoting reference 444a to Central Personnel Services, English Electric Company Ltd., 24/30, Gillingham St., London, S.W.1. 4951

ESTIMATOR (Senior) required by Electric Motor Manufacturing Company in the West of England. Experience in operation planning an advantage. Good prospects. Applicants must give list of previous employment, with dates and salary required to Personnel Manager, Newman Industries Limited, Yate, Bristol. 5144.

EXPERIENCED designer of rotating electrical machines required for responsible technical administrative position with important manufacturing company; applicants should be conversant with modern trends of design and engineering analysis and have ability to develop new projects to completion; evidence of good organizing ability and successful supervision of the work of others is required; education to degree standard and some years practical designing experience on large and medium-size machines are essential;opportunities are available for occasional foreign travel for technical studies; attractive progressive salary and excellent conditions will be offered. Apply with full details, in strict confidence. to Box 5012.

EXPERIENCED Linesmen required for power line construction work in all parts of the British Isles. Rates of pay in accordance with Civil Engineering Construction Conciliation Boards agreement.- Please apply in writing to Contract Department. Henley's Telegraph Works,51-53 Hatton Garden, London, E.C.1, giving details of recent experience and employers 5052.

EXPERIENCED Draughtsmen required with knowledge of Refrigeration preferred but not essential. Apply giving age and technical training, to Chief Draughtsman J. & E. Hall, Ltd. Dartford, Kent. 5124.

EXPERIENCED engineers accustomed to the erection of lattice tower, concrete and wood pole overhead transmission lines and willing to serve either at home or overseas, age 25 - 45. Write giving full details to Staff Officer, British Insulated Callender's Construction Co.Ltd., 21, Bloomsbury St. London, W.C.1. 5068.

EXPERIENCED Representatives required by well known E.W.F. Electrical and Radio Wholesalers; good existing connections essential amongst Contractors and Industrial users, in Berks, Bucks, Oxon, Hants, Surrey, etc. Good salary, expenses and commission. Apply in writing stating experience to A.S. Duran & Co. Ltd., 30, King's Road, Reading, 'Phone 5093. 5142

FILAMENT Dept. Operator required for coiling machine setting in large modern Electric Lamp Works, East London, previous experience essential. Write giving age, experience and wage required. Box No. 5090.

FOREMAN linesman fully experienced in all types of power line construction requires for South Africa, permanent position for the right man.- Apply in writing to the Contract Department, Henley's Telegraph Works, 51/53 Hatton Garden, London, E.C.1. giving full particulars of experience, recent references and age 4910

HIGHLY skilled electricians required for Ministry of Works and War Office contracts. Preference given to men used to handling and jointing L.T. underground cables and L.T. overhead distribution systems. Midland area. Willing to travel. State experience. Electra Ltd., 12a Barwick Street, Birmingham, 3. 5136

ILLUMINATING engineer, experienced in modern lighting practice, required in London I.E. Department for the planning, estimating and supervision of street lighting projects.- Applications, stating experience qualifications and age, to Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames St., E.C.4. 5064.

JUNIOR engineer to commence on routine electrical design work. Some experience in light electrical apparatus an advantage. Minimum qualification Ordinary National Certificate (Electrical Engineering).-Apply stating full particulars of experience, etc., to Personnel Dept., Telephone Manufacturing Co. Ltd. Martell Road, West Dulwich, S.E.21. 'Phone Gipsy Hill 2211. 5123.

LARGE manufacturing firm, producing electrical cookers and domestic applisances, will shortly be appointing a senior sales representative for the Midlands area; this important position is a permanent and progressive one and carries with it a retiring pension; men of good education with sound electrical background, knowledge of the products and actual sales experience are invited to apply, in writing, giving full details of experience and salary required to Box No. 5054.

LARGE firm of Mechanical engineers near Birmingham require an Assistant to the Electrical Engineer, H.N.C. Good workshop and Drawing Office experience desirable. Age 22/28 years. Replies, giving full details to Box No. 5141.

LIFT Layout draughtsman wanted; good wages, plus bonus.- Apply Marryat & Scott, Ltd. Wellington Works, Hounslow. 5005.

LINESMEN-ELECTORS, fully qualified on Wood Pole, Concrete Pole and Lattice Tower construction, wanted for overhead transmission Line work in Great Britain and Overseas. Standard rates and good prospects of permanent employment. Only fully experienced men need apply. Write stating age, experience, etc. to Box No. 5139.

METER tester and repairer, d.c. and a.c. single and polyphase; London S.W. district. Box 137.

NELSON RESEARCH LABORATORIES. English Electric Co. Ltd., Stafford, require draughtsman for development work on vacuum devices, including industrial type electronic valves. Must have flair for design of jigs and fixtures for assembly and processing of components and be familiar with modern shop techniques in this field. Salary according to qualifications and experience. Apply, mentioning reference 143A, to Central Personnel Services, 24-30, Gillingham St., London, S.W.1. 4991

NEON sales representative, experienced; excellent opportunity; good commission paid to man with drive and initiative. Apply, giving details of experience, to Youngsigns Ltd., Brent Cross Works, North Circular Road, London, N.W.2. 5009

PHYSICIST (male) required in Research and Development Laboratory of large well known concern. Essential qualifications, should be graduate in physics with high standard of mathematics and have had some experience in industry. Work will mainly be on development of mechanical, thermal and electrical equipment of precision nature. Applicants should give full details of age, training and experience (in chronological order) and indication of salary required. Only those who conform to requirements of advertisement need apply to Box No.5132

PUBLICITY DEPARTMENT of prominent engineering company in Yorkshire requires experienced assistant, age 25-30. Capable of producing first class advertising layouts for the technical press and handling routine duties. Only those with necessary experience need apply. All applications will be answered and treated in strict confidence. Write stating age and salary required to Publicity Manager, Box. 5027.

REPRESENTATIVES required by a domestic electric cooker and appliances manufacture; must have established connections with the electricity authorities and wholesalers in the Birmingham and Leicester areas. Full particulars, stating age experience and salary required to Box 5011

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REQUIRED an Electrical Engineer for the preparation of schemes, estimates and the execution of industrial electrical installations, preferably with Flour Mill experience, including conversions from existing to electric drive, switchgear, alternators, transformers, shafting, drives and motors up to 500 H.P. Permanent position would be offered. Write stating age, experience and salary required to Christy Brothers (Chelmsford) Ltd., Electrical Engineers, Chelmsford. 9041.

SALES Representative required by well known manufacturers of Electric Light Fittings, preferably with connection. Keen young man without experience but with personality, tact and initiative would be considered for the post,which carries a good salary and prospects. Box 5004.

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THE contracts manager of a large Engineering Company in the Midlands requires an assistant who is familiar with modern Turbine, Switchgear, Transformer and Electrical Machines practice and be capable of dealing with comprehensive contracts for their supply. The successful applicant must have first class technical and practical qualifications and be able to take responsibility and act on his own initiative. Preference will be given to those applicants with a strong leaning to Switchgear, who must be capable of discussing relevant switchgear problems up to 22kv. A high salary will be paid to the successful applicant. A superannuation scheme is in operation. Only those candidates who fully satisfy these requirements will be considered. Please apply in own handwriting to Box No. 5070.

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TRANSFORMER DESIGNER with experience in design of power transformers up to 3,000kva and 66kv, and rectifier transformers up to 1,000kva; a knowledge of overseas specifications an advantage; salary according to age and experience. Apply Personnel Officer, Foster Transformers & Switchgear Ltd., South Wimbledon, S.W.19. 4867.

WATT-HOUR METER and electrical instruments; engineers having extensive design experience with these devices are required by The English Electric Co., Ltd., Stafford; these vacancies are senior positions carrying salaries from £600 p.a. to £1,000 p.a.; unusually pleasant factory, ideal working conditions both physically and psychologically. Write, giving full details, quoting reference 406C, to Central Personnel Services, English Electric Co., Ltd., 24 - 30, Gillingham St., London, S.W.1. 4955

YOUNG electrical engineers required by specialists in large power station equipment - boiler plant, coal and ash plants, and ancillary equipment; work involves preparation of schemes and tenders for motors, starters, switchgear, cabling and control systems; sound technical training required; previous experience desirable but not essential; excellent working conditions and prospects; pension scheme in operation; full details of age, qualifications and experience to Personnel Department, Simon-Carves, Ltd., Stockport. 4911

YOUNG electrical engineer required for motor control gear in Midlands, d.o. experience and ability to make calculations; age experience and salary to Box 5055.

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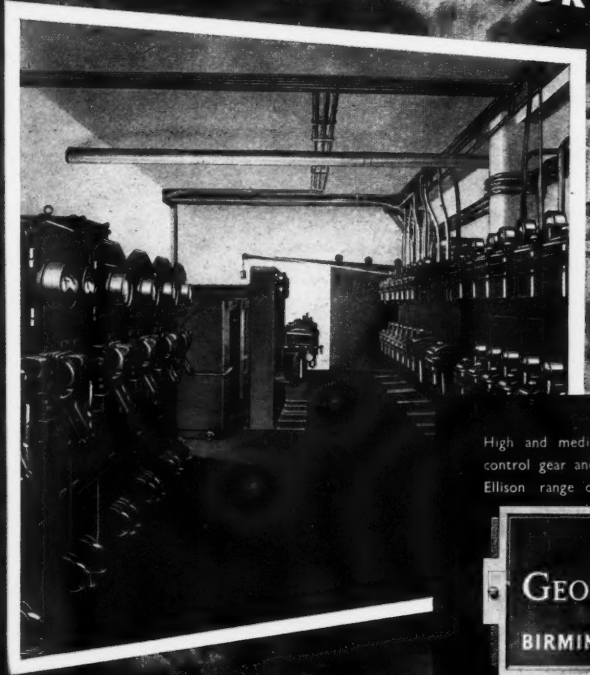

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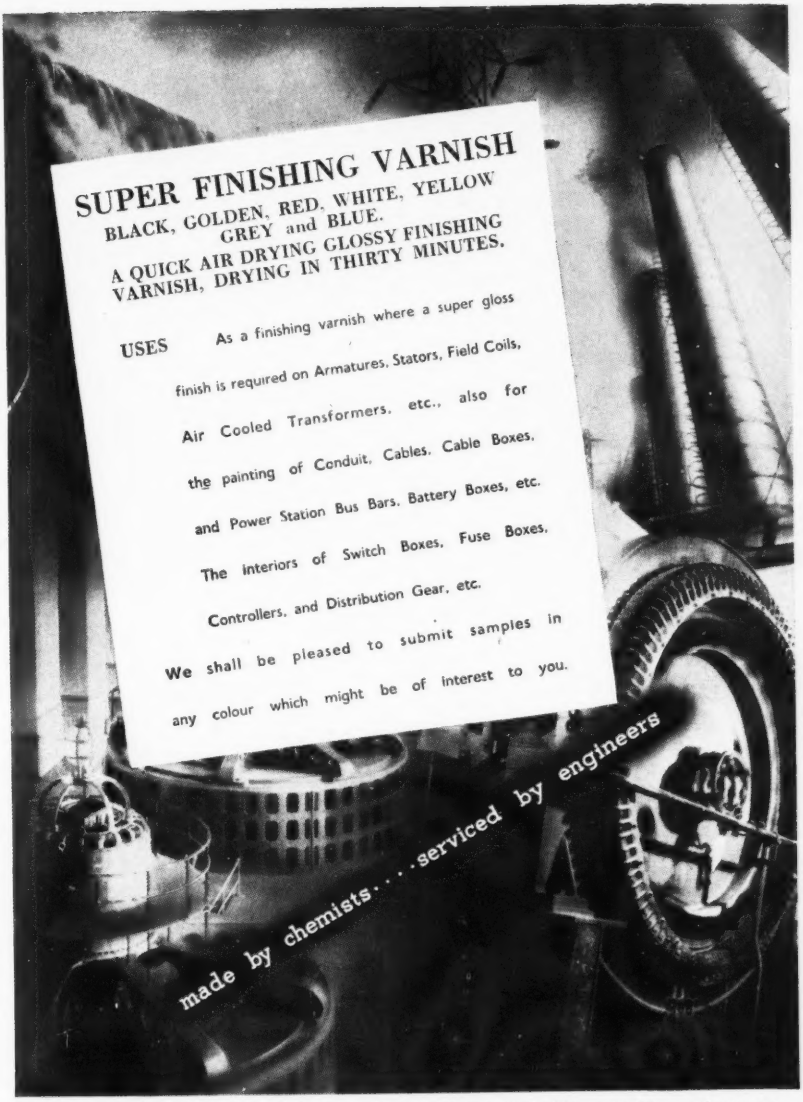
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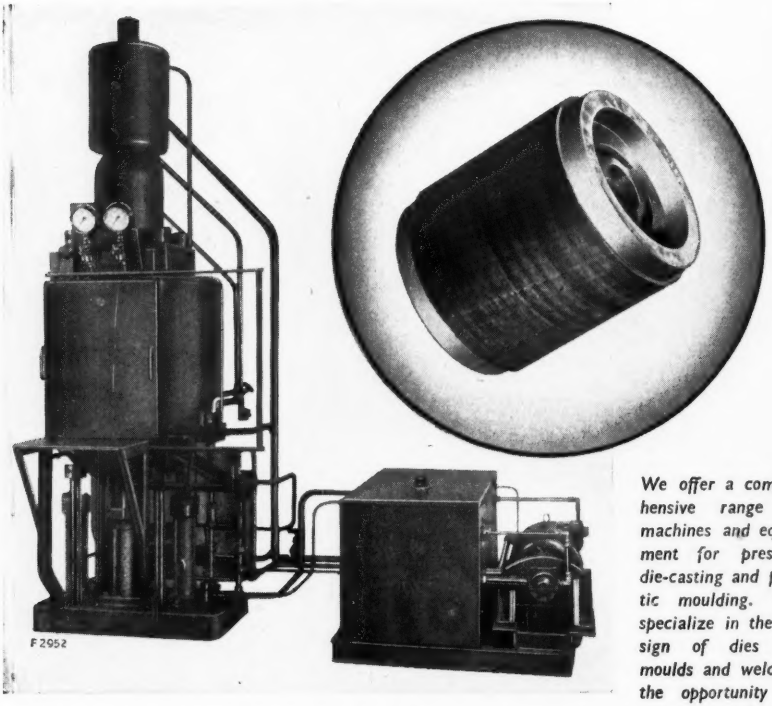

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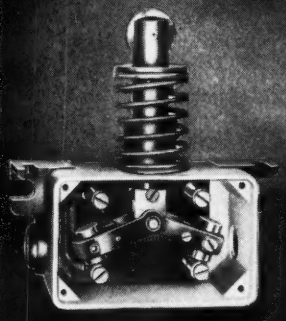

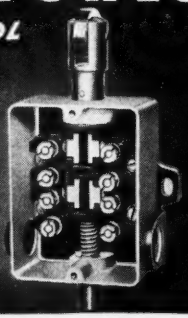

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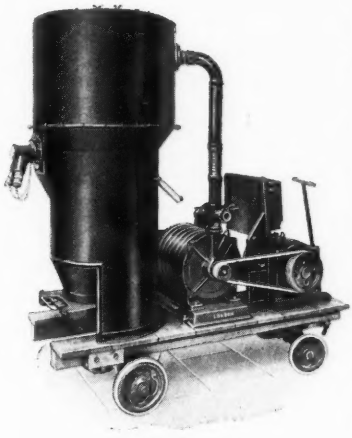

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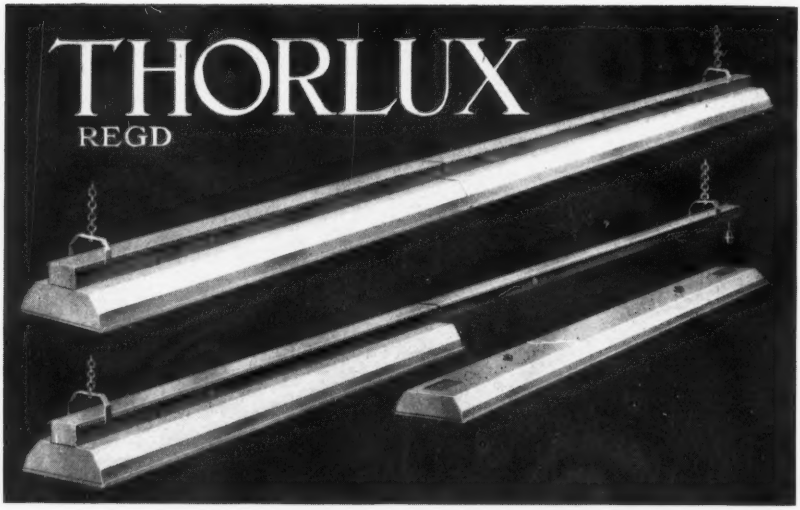

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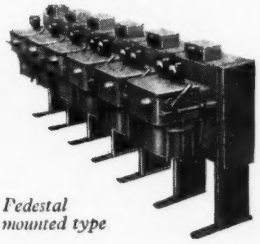

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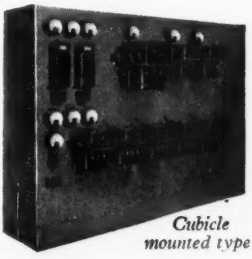

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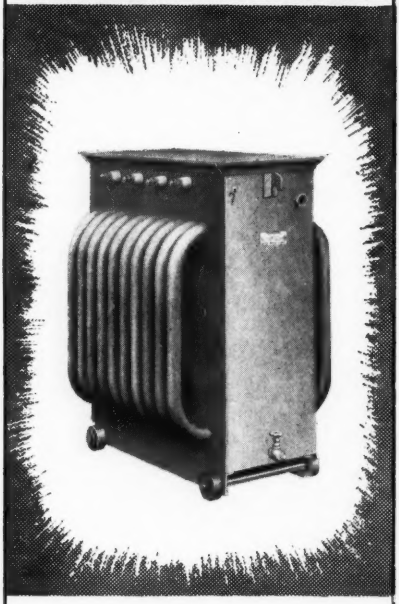

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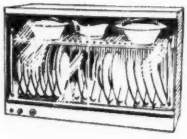

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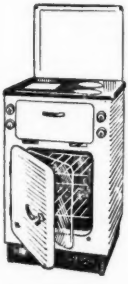

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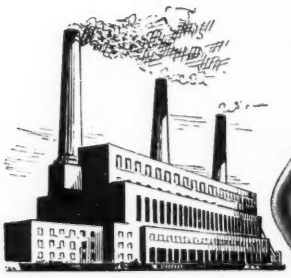

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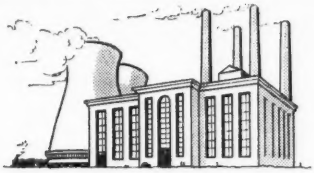

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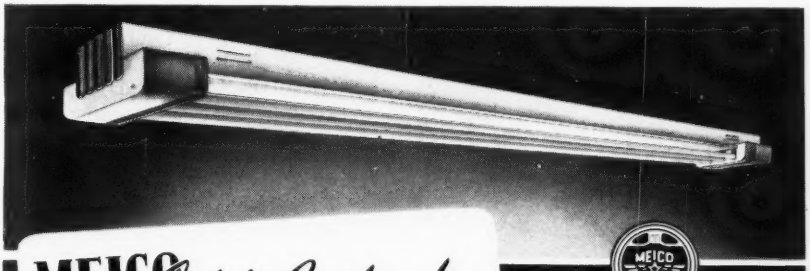

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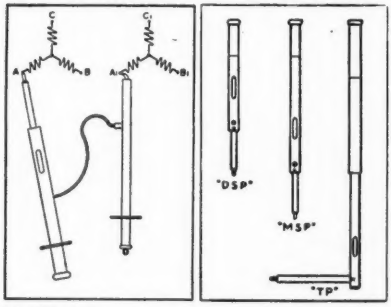

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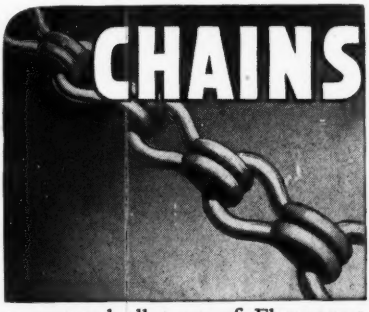

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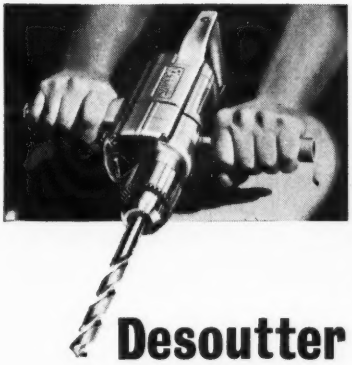

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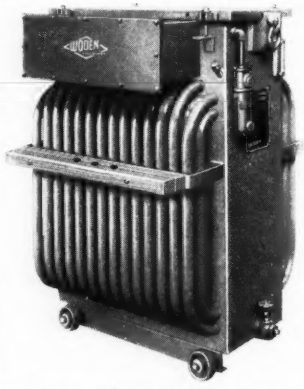

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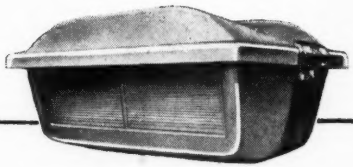

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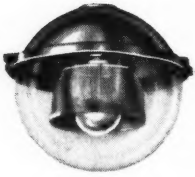

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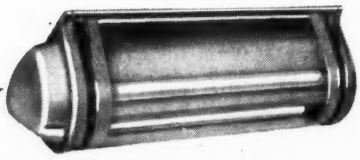

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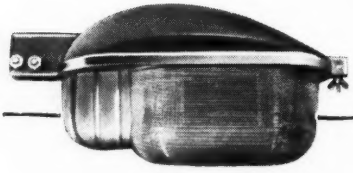

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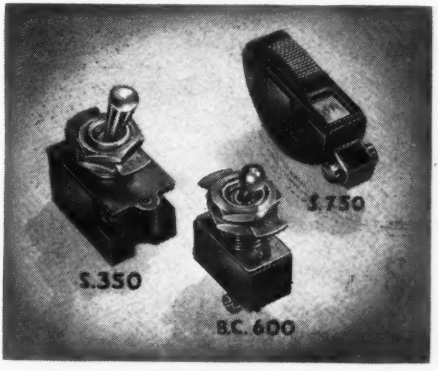

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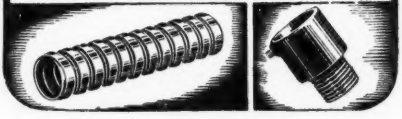

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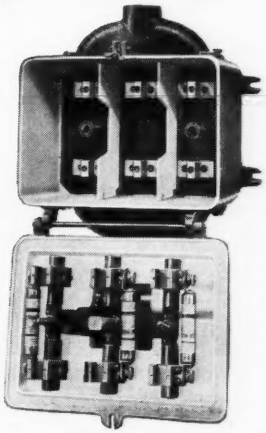

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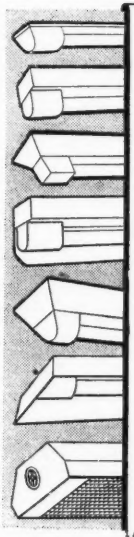

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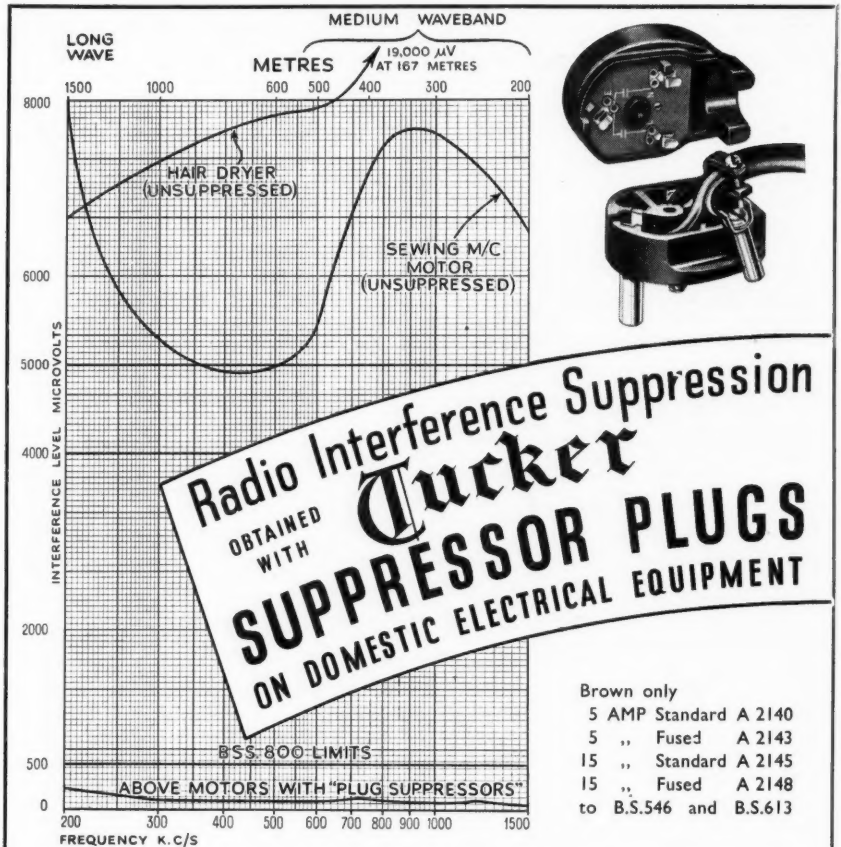

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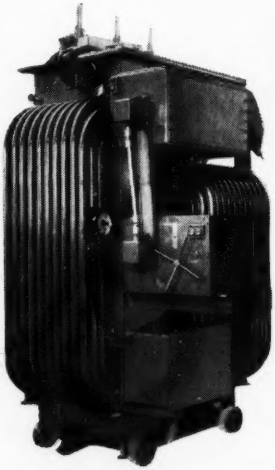

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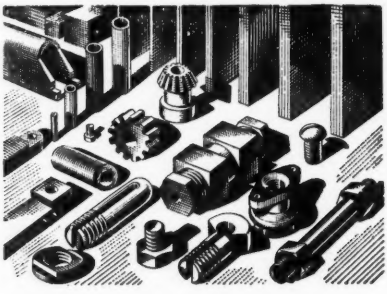

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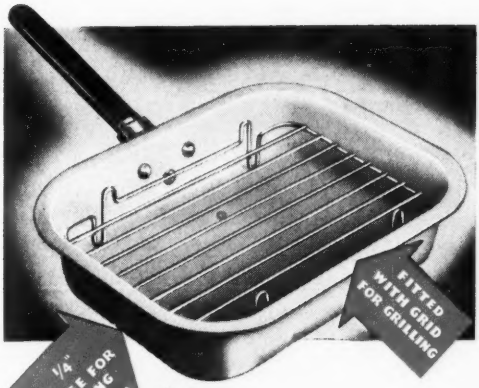

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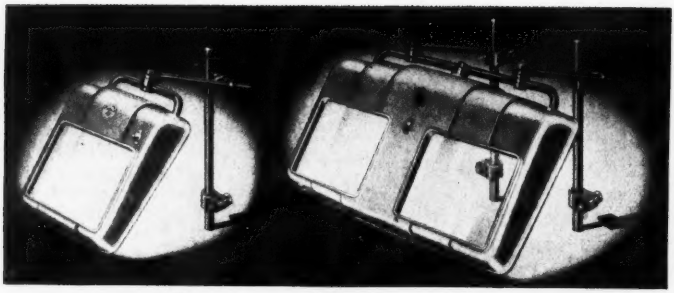

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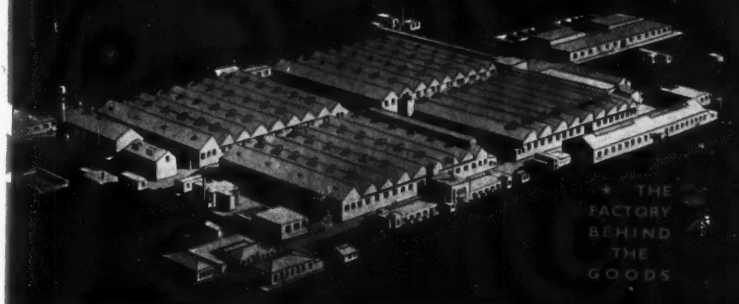

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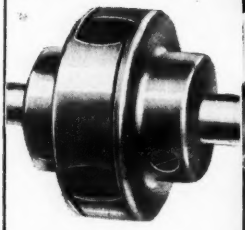
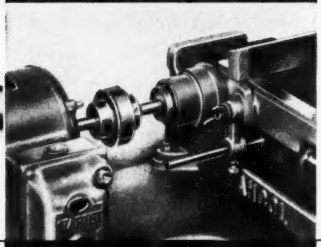
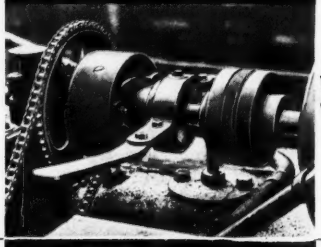


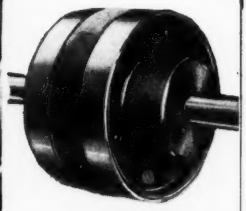


Designed for the transmission of low horsepowers at high speeds, these couplings will operate successfully under oily conditions and will take care of a small amount of angular or axial shaft displacement.

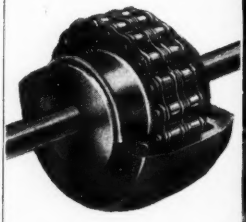
FLEXIBLE COUPLING (DISC TYPE)

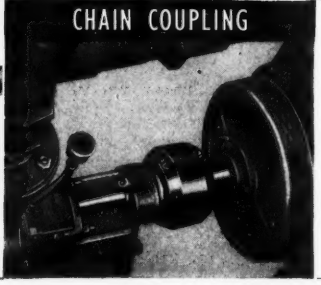
This coupling is suitable for dealing with vibration or shock due to impulsive loads. The torque is transmitted to and from the flexible disc by alloy steel pegs mounted alternately in cast iron flanges keyed to the shafts.





CHAIN COUPLING





An outstanding advantage of this form of coupling is the ease with which the shafts can be disconnected by simply removing the chain. A cover of smooth exterior contains lubricant and provides protection from dust or grit.

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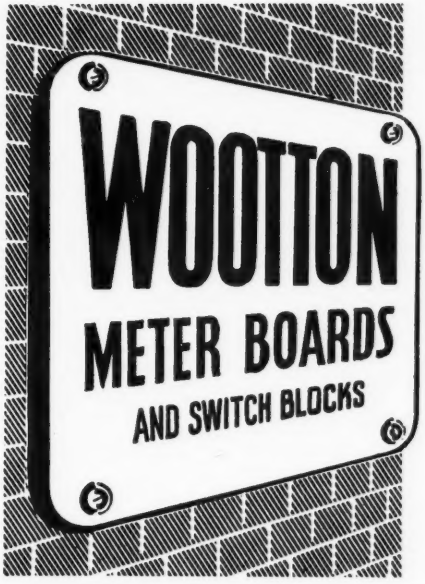

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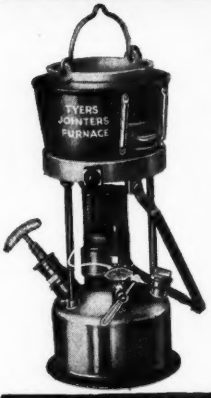

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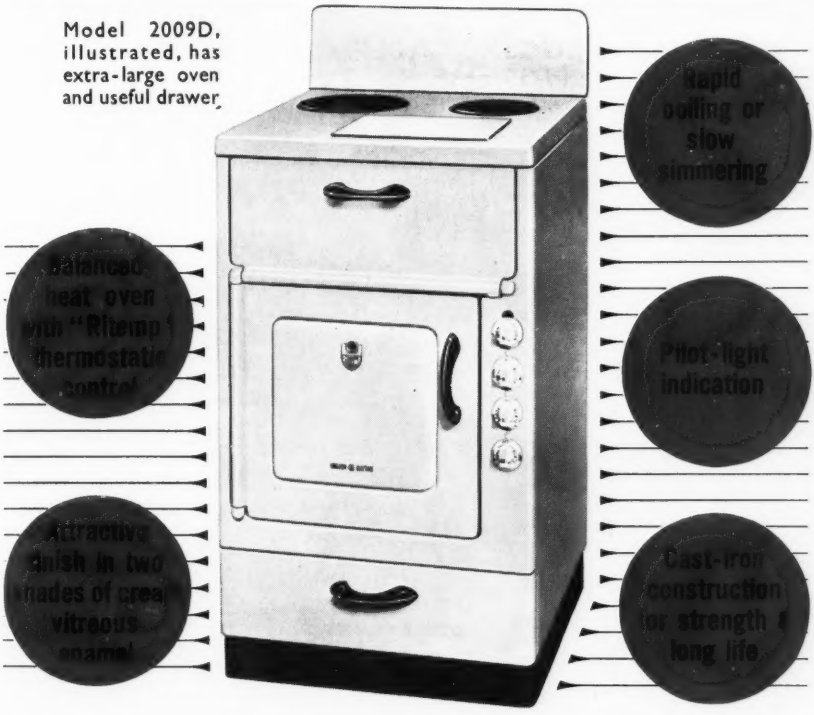
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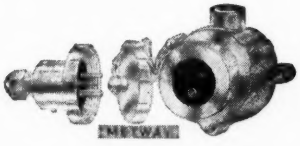

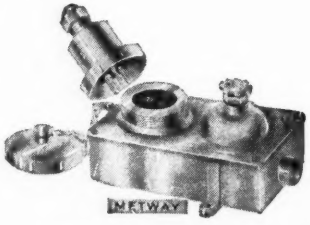

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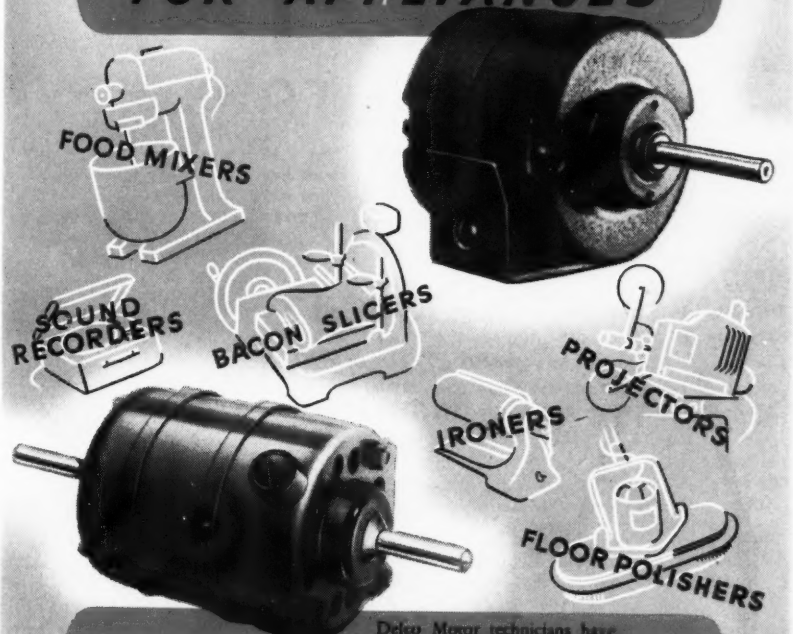

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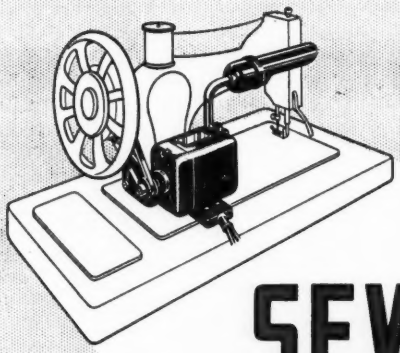

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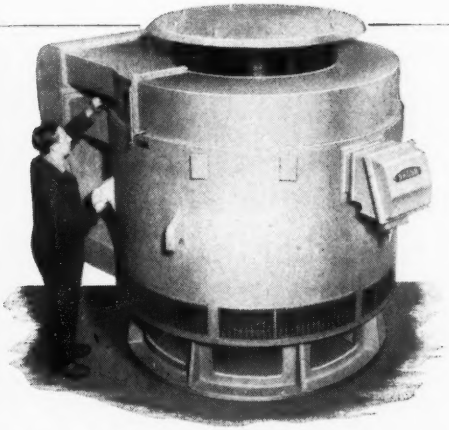

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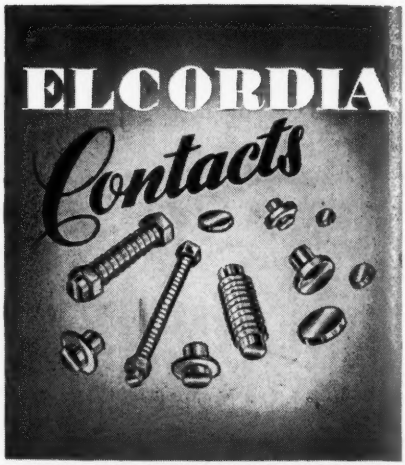

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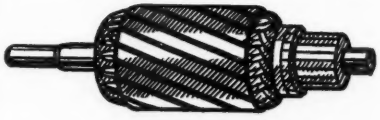

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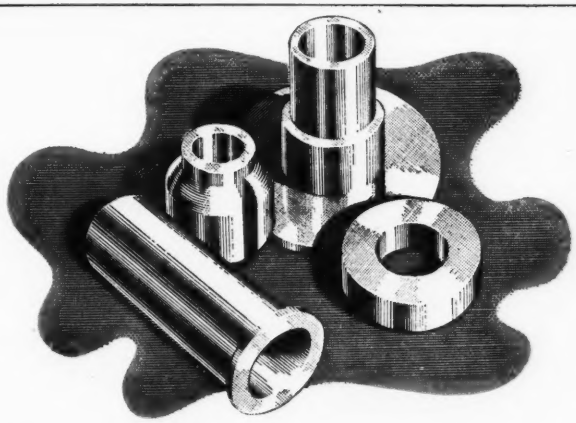

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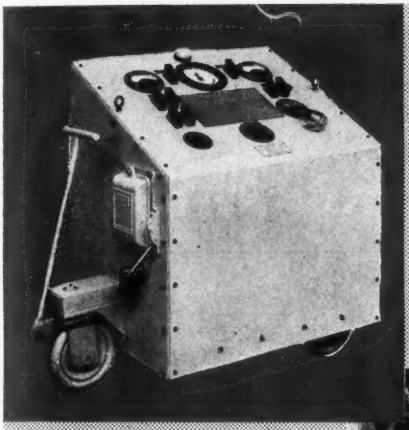

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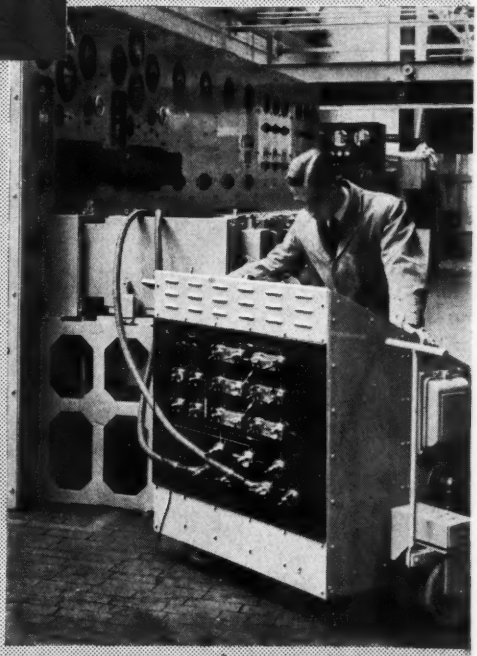

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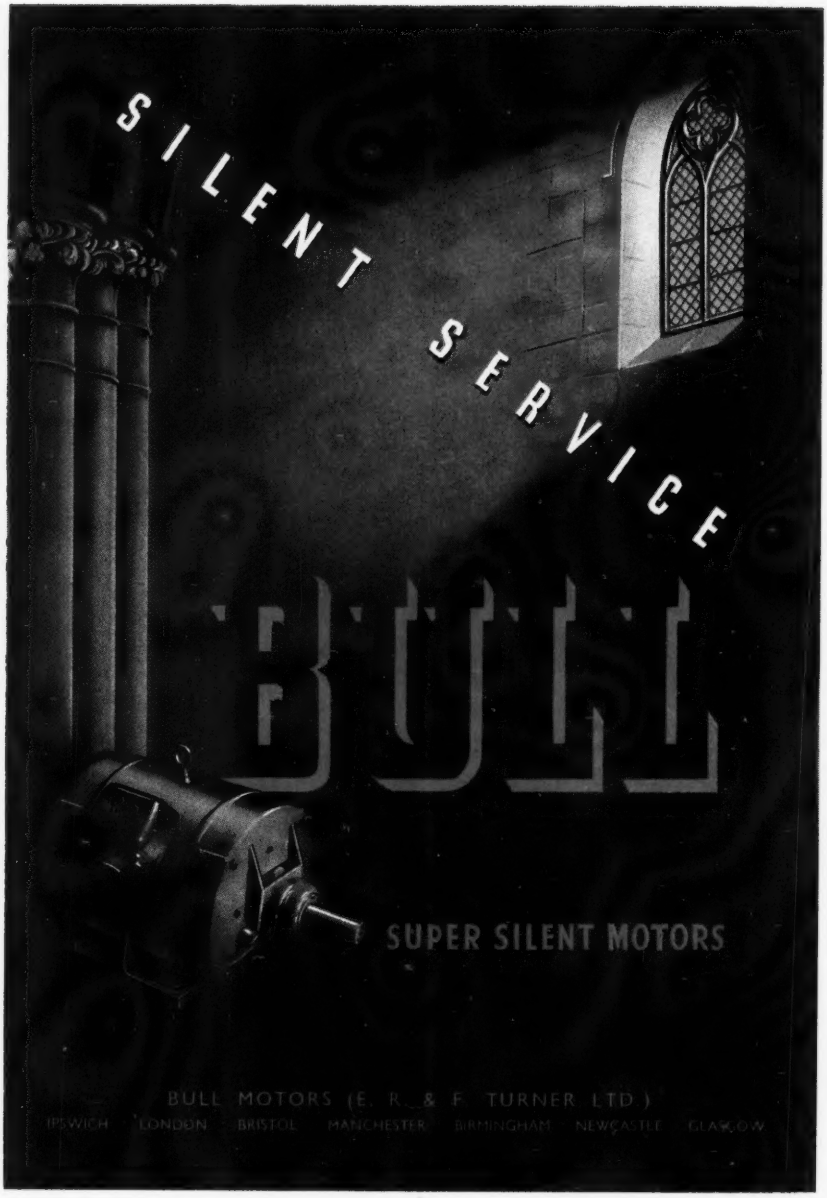
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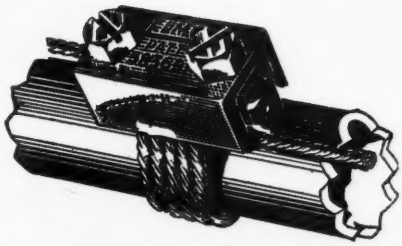

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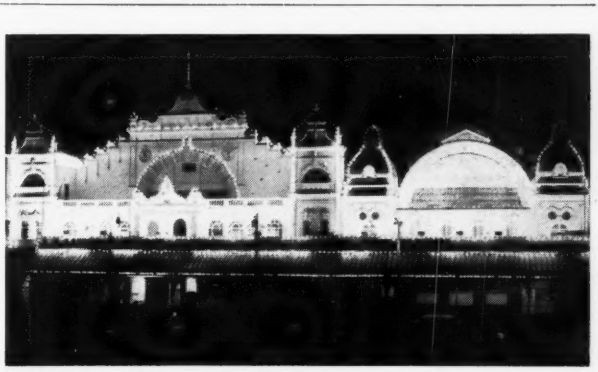

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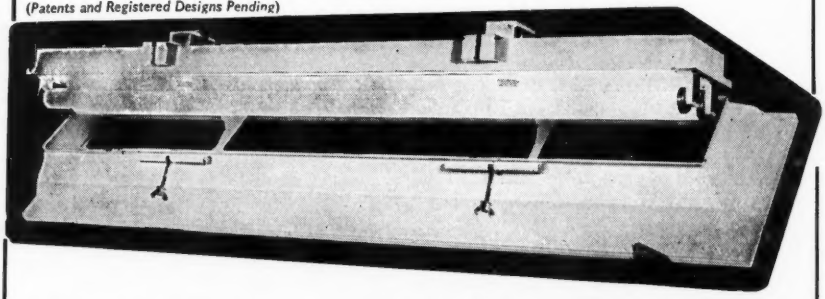

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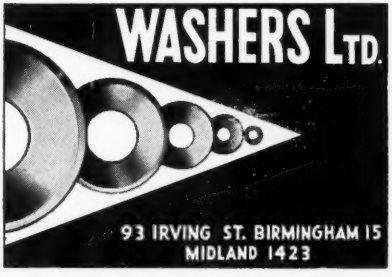

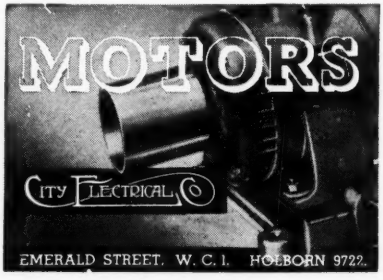

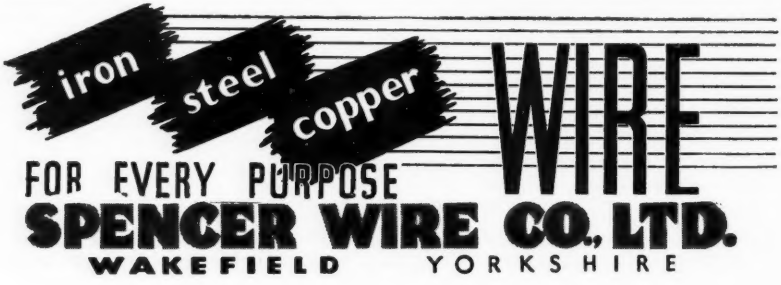

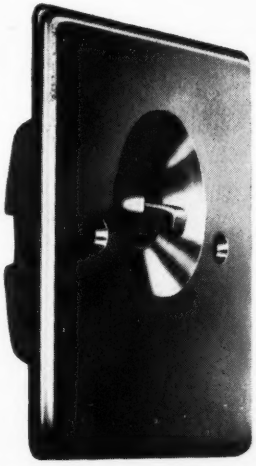

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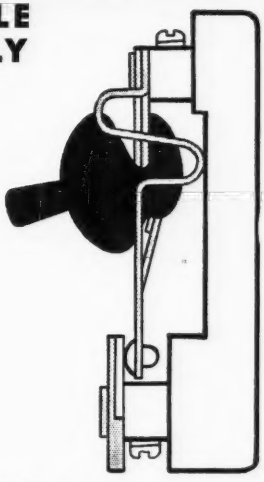
THE ROLLS SWITCH

VIRTUALLY INDESTRUCTIBLE ELECTRICALLY or MECHANICALLY

Because ROLLS SWITCHES have

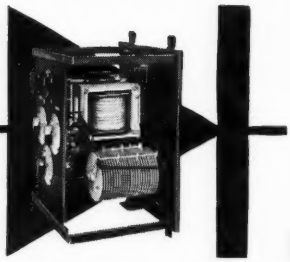
NO Coiled or highly stressed springs
NO Moving links, pins or spindles
NO Distortable copper contact springs
NO Riveted levers or wearing surfaces
NO Plated or flimsy contact surfaces
NO Fragile or brittle insulation
NO Steel parts to corrode
NO Interior screws to work loose
NO Harsh or jerky dolly action
NO Partial make and break
NO Flabby or slack dolly movement



ROLLS SWITCHES LIMITED
154/6 BLACKFRIARS ROAD, LONDON, S.E.1

THE WORLD'S HIGHEST STANDARD OF SWITCH RELIABILITY

from



SenTerCel

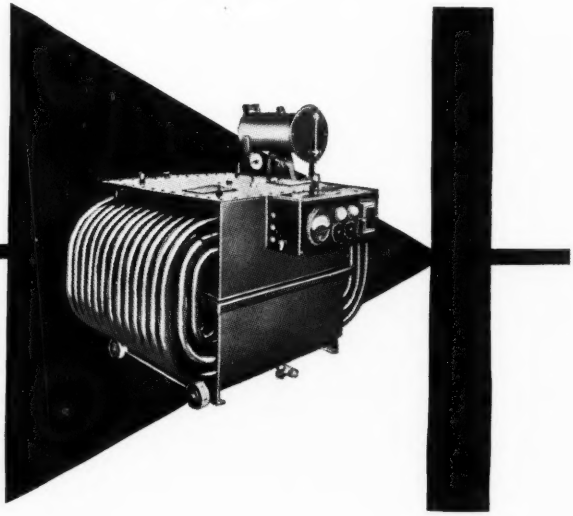
Selenium Rectifier Equipments are manufactured in all sizes and types from the smallest to the largest and from the simplest to the most complicated.

Standard types for common applications are readily available.

In addition an Engineering Department is maintained to design equipments specially to customers' individual requirements:—

Battery Charging
Electrolytic Deposition
Electrostatic Precipitation
Engine Starting
Cathodic Protection
Alternator Excitation
Dynamic Braking
D.C. Power Supplies
of all types

to



Top illustration: Battery Charger (Cover removed)
Lower illustration: E.H.T. Rectifier Equipment (Oil immersed)

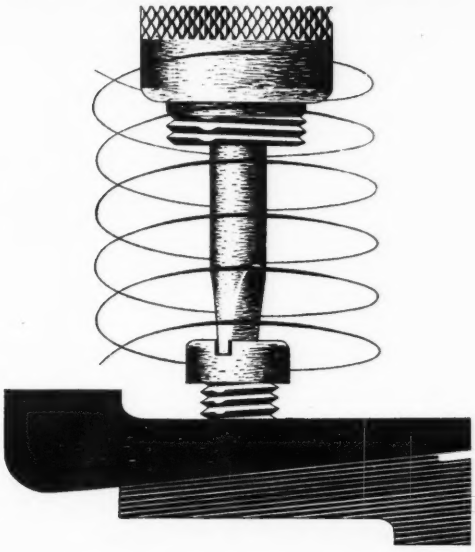
SELENIUM SenTerCel RECTIFIERS

Standard Telephones and Cables Limited RECTIFIER DIVISION

Registered Office: Connaught House, Aldwych, London WC2

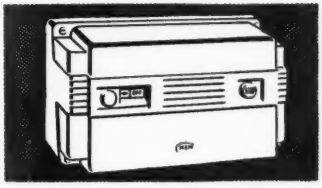
Warwick Road, Boreham Wood, Herts. *Telephone: Elstree 2401* *Telegrams: Senterce! Borehamwood*

It all comes into Switchcraft



PUTTING A SPIN ON THE SCREW If a screw could get dizzy, it would in the MEM works where deft-fingered girls use power operated screwdrivers to drive home a dozen screws in a few seconds. MEM mass precision means just this kind of speeding up in every process of manufacture and assembly. That's why fine engineering by MEM costs you surprisingly little.

Send for latest list on Auto-Memota starters.



The new Auto-Memota Star-Delta starter brings you many advanced features.

MEM

Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., BIRMINGHAM 11

Branches in London and Manchester

Vent-Axia
for Better Air Conditions

IN INDUSTRY
IN COMMERCE
IN AGRICULTURE
IN THE HOME

Simplest form of controlled ventilation

VENT-AXIA LTD.
9, VICTORIA ST., S.W.1. ABBey 6441 (7 lines)
Glasgow · Manchester · Birmingham · Leeds

BMS
We specialise in Light Pressings with rolled threads of all descriptions.
ROLLED THREAD LAMPHOLDERS
M.E.S. HOLDERS
Let us quote you Highest quality work, good deliveries.
BAKER METAL STOPPER CO. LTD.
HADLEY STREET, KEY HILL
BIRMINGHAM 18
Tel.: Northern 3931-2
Telegrams: "Screwcap" Birmingham 18

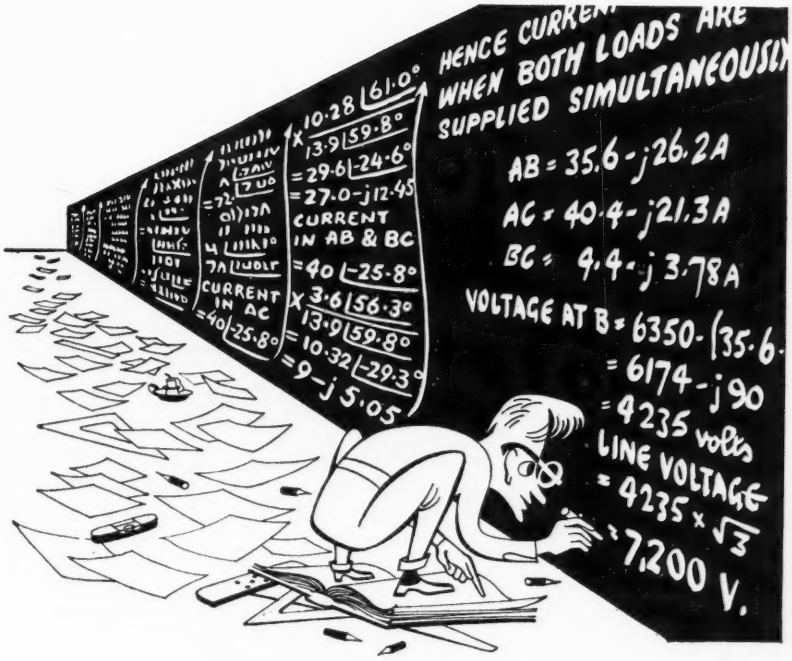
TRANSFORMERS

for special applications. Immediate "Sturdy" service.

All types 50 VA to 25 kVA. For test gear, switchboards, control panels, furnaces, etc. Built to your specification.

Performance and manufacture fully guaranteed. Quotations by return.

STURDY ELECTRIC CO. LTD.
BURNOPFIELD (Phone 237), NEWCASTLE ON TYNE

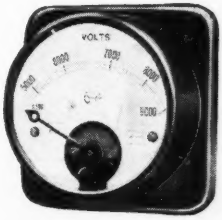


The right answer . . .

by

Crompton

INSTRUMENTS



FOR INDUSTRIAL
AND EDUCATIONAL PURPOSES

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2

YOU GET UP TO 20% MORE LIGHT FROM

MAZDA

COILED-COIL LAMPS

THE OUTSHINING LIGHT

Mazda Coiled-Coil lamps are now available in 40, 60 and 100 watts, Silverlight, Pearl and Clear ; and 75 watts, Pearl and Clear only. What a wonderful return in extra light for the extra penny or two on the price of the lamp! It *pays* to specify MAZDA Coiled-Coil.

MAZDA LAMPS AND LIGHTING EQUIPMENT

Made in England by B·T·H *Leaders in Lighting*

The British Thomson-Houston Co. Ltd., London, W.C.2
Member of the A.E.I. Group of Companies.

4313

MICA UNDERCUTTERS

Mica Undercutting by the use of files (and "sweat"), has always been regarded as a method productive of satisfactory results.

The Universal Motor driven

"JIFF-V"

Undercutter gives a similar clean "V" slot in a "Jiffy," and eliminates the hard and tedious work.

The high speed file is easy to guide, and permits cutting clear up to the commutator risers.

Can be used on commutators of all sizes above 4" diameter, without removing the Brush Arms.

Thousands of

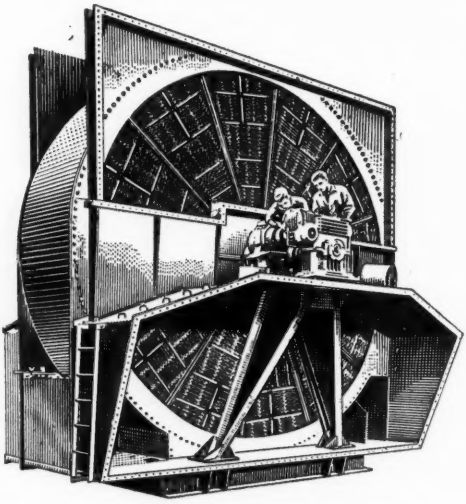
"JIFF-V"

Undercutters in use all over the world.

MARTINDALE ELECTRIC CO. LTD., 4 WESTMORLAND RD., LONDON, N.W.9

Telephone : COLindale 8642/3 Telegrams : "Commstones, London"

SM/EGA. 137/2



HOWDEN-LJUNGSTROM AIR PREHEATERS
HEAVY DUTY FANS
SINTERING FANS
HOWDEN TURBULENT FLOW AIR PREHEATERS
MECHANICAL DRAUGHT FANS
HOWDEN I.C.I. GAS WASHERS
HOWDEN CENTICELL DUST COLLECTORS
HOWDEN VORTEX DUST COLLECTORS

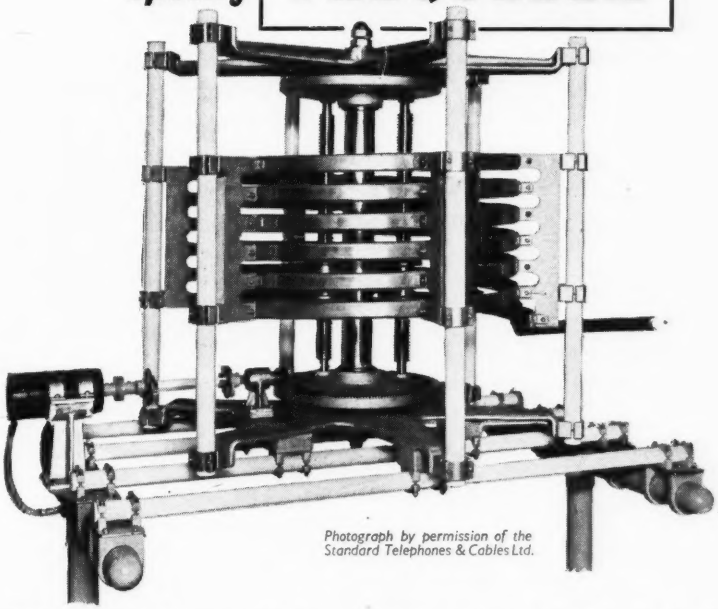
Howden auxiliaries for all types of boilers, from the largest power station plant to the smallest industrial installation

HOWDEN

JAMES HOWDEN & COMPANY LTD.
195 Scotland Street, Glasgow, C.5, and Caxton House, Westminster, S.W.1

FOR HIGH-FREQUENCY INSULATION-

specify 'FREQUELEX'



Photograph by permission of the Standard Telephones & Cables Ltd.

The Tuning Coil shown is supported by our "FREQUELEX" Ceramic Rods, and forms part of a 200 K.W. Radio Transmitter.

This is only one of many applications where Rods made to close limits are required.

We specialise in the manufacture of Ceramic Rods and Tubes of various sections in several classes of materials over wide dimensional ranges.

The Principal Materials are :—

1. **Porcelain for general insulation.**
2. **Frequelex for High Frequency Insulation.**
3. **Permalex and Templex for Capacitators.**

The degree of accuracy depends on the size of the Rod or Tube, but the standard degree of accuracy is outlined in the Inter Service Component Manufacturer's Council—Panel R Specification embodied in our Catalogue of Radio Frequency Ceramics, copy of which will be sent on request.

Large Rods up to 44" long and 1¼" square are used as supports for Tuning Coils, etc.

We shall be pleased to have your enquiries for all sizes of Tubes and Rods. Prompt deliveries can be given for most sizes.

Bullers LOW LOSS CERAMICS

BULLERS LIMITED, 6 Laurence Pountney Hill, E.C.4. Phone: MANsion House, 9971 (3 lines)

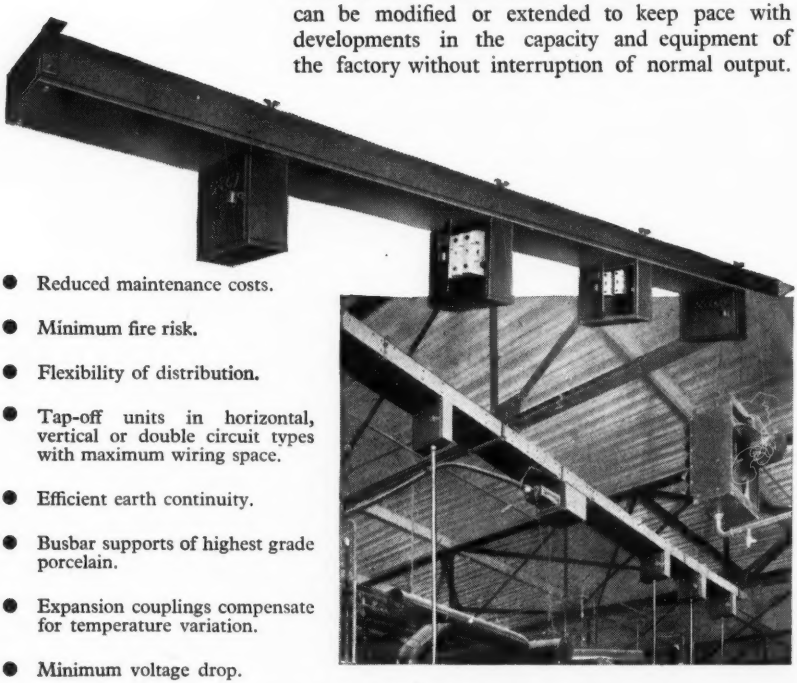
Grams: Bullers, Cannon, London.

B4A

G.E.C.

PLUG-IN BUSBAR SYSTEM

This modern method of power distribution in industry enables power installation layouts to be achieved with minimum labour costs. Installations can be modified or extended to keep pace with developments in the capacity and equipment of the factory without interruption of normal output.



- Reduced maintenance costs.
- Minimum fire risk.
- Flexibility of distribution.
- Tap-off units in horizontal, vertical or double circuit types with maximum wiring space.
- Efficient earth continuity.
- Busbar supports of highest grade porcelain.
- Expansion couplings compensate for temperature variation.
- Minimum voltage drop.

Write for particulars of G.E.C. Industrial Metalclad Distribution Systems

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 7 words) per insertion. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-.

DISPLAYED:—42/- per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the Renewal of the Electrical Installation at Rothwell Grammar School. The specification with plan, together with conditions of tender, may be obtained on application to the County Architect, Bishopgarth, Westfield Road, Wakefield, on payment of a deposit of £1 1s., which will be returned on receipt of a bona fide tender. Cheques must be made payable to the " West Riding Treasurer " and crossed " & Co."

The contract will be under the provisions of the R.I.B.A. conditions and form of agreement.

The specification and plan will be available on and after the 11th January, 1951.

Sealed tenders must be addressed to me, the undersigned, and received at Room 3, County Hall, Wakefield, not later than 10 a.m. on Monday, 29th January, 1951.

BERNARD KENYON,
December, 1950. Clerk of the County Council.
6618

COUNTY BOROUGH OF BLACKPOOL

TENDERS are invited for the supply and delivery of:—

(a) One Motor-driven (Petrol) 3-ton Chassis for Tower Body (b) below.
(b) One Sectional Tower Body with power elevation fitted on Chassis (a) above.
(c) Four Sectional Trailer-type Tower Ladders.

Specifications and forms of tender, which will be issued separately for (a), (b) and (c), may be obtained from the Illuminations and Public Street Lighting Officer, Electrical Services Department, Rigby Road East, Blackpool, and must be returned to the undersigned in a plain sealed envelope endorsed " Tender for Tower Waggons " and not bearing any name or mark indicating the sender, not later than 10 a.m. on Saturday, the 6th January, 1951.

TREVOR T. JONES, Town Clerk.
6656

SITUATIONS VACANT

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited from persons who have held a responsible position in the electricity supply or motor industries for the position of 2ND ASSISTANT ENGINEER in the Chief Engineer's Department, at St. Mellons.

Applicants should have had extensive experience in workshop practice. The duties of the position will include interpretation of the Board's transport policy, responsibility for compliance with statutory regulations, acquisition of vehicles and specialised plant, standardisation of workshop procedure, control of transport and workshop costs, advising on the layout of the Board's workshops and the operation and maintenance of all transport.

The commencing salary will be £752 per annum, rising by five annual increments to a maximum of £884 per annum, in accordance with Class AX, Grade 2, of the National Joint Board Schedule for the Electricity Supply Industry, and thence upon present classification to Grade 2, Class CX, £920 to £938, by two biennial increments.

Detailed applications, stating age, qualifications and experience, both in mechanical and automobile engineering, details of present appointment and salary, together with the names and addresses of three referees, should be submitted to the Secretary (Establishments Section), South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than 15th January, 1951.

D. G. DODDS, Secretary.
6657

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters,
Chief Engineer's Department

THIRD ASSISTANT ENGINEER (Operation and Construction) (Vacancy No. 82/50). Applicants should possess the Higher National Certificate in Electrical Engineering as a minimum qualification and be Corporate Members of the Institution of Electrical Engineers.

The duties will be to assist in the operation of the main distribution system up to 66-kV, including investigation of faults and protection irregularities.

Salary, N.J.B. Schedule C, Grade 5. Commencing salary between £579 and £710 rising to £776 per annum in Class DX.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, within fourteen days of the appearance of this advertisement.

No. 5 (Wakefield) Sub-Area

INSTALLATION ENGINEER (Castleford District) (Vacancy No. 97/50). The person appointed will be responsible for the organisation and administration of the installation section, including the supervision of manual workers, and must be capable of preparing specifications and estimates, dealing with correspondence, carrying out complete installations of all types, and must have a thorough knowledge of the Electricity Supply Regulations and the Institution of Electrical Engineers' Regulations for the electrical equipment of buildings.

Salary, N.J.B. Schedule, Class E, Grade 8, £550/£560 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, within fourteen days of the appearance of this advertisement. 6623

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, Crawley District. Salary of £492 per annum to £518 per annum under the N.J.B. Schedule, Class B, Grade 7. Superannuation will be arranged. Applicants should have experience in the design, construction, operation and maintenance of single and three-phase H.V. and M.V. distribution underground and overhead systems, together with indoor and outdoor type sub-stations, including fault location. Duties involve standby.

Applications, giving two referees, must reach F. A. Avery, Esq., Crawley Manager, South Eastern Electricity Board, 55, High Street, Crawley, by 6th January, 1951.

DISTRICT COMMERCIAL ENGINEER, Worthing District. Salary £722 rising to £752 under N.J.B. Schedule, Class E, Grade 4. Superannuation will be arranged. Candidates should be qualified engineers with extensive experience in an electricity commercial department. The District incorporates the former districts of Littlehampton and Shoreham and has 41,000 consumers. The commercial department covers: Sales (4 showrooms); large contracting department; consumers' service and repair workshop. The person appointed will be responsible to the District Manager for the department, for negotiations for supply and tariffs with all classes of consumer, and for commercial statistics and data; he will also be considered for the tenancy of a detached house in the district.

Applications, giving two referees, must reach M. J. Mortimer, Esq., M.I.E.E., Worthing Manager, South Eastern Electricity Board, 56, Chapel Road, Worthing, by 6th January, 1951.

A. L. BURNELL, Secretary.
December, 1950. 6621

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Assistant Sub-Area Engineer

APPLICATIONS are invited for the appointment of an ASSISTANT SUB-AREA ENGINEER in the No. 4/5 Sub-Area based on Sub-Area Headquarters, Electricity House, Rhostyllen, Wrexham.

The salary payable will be in accordance with the revised National Joint Board Agreement, Class H, Grade 3, i.e., £948 to £994 per annum.

Applicants should have a good general and technical education and be Chartered Electrical Engineers. The area is very large and the operations will be wdespread over difficult country, involving the control of a large and scattered staff. It is essential that applicants should have considerable practical knowledge and experience of the design, construction, operation and maintenance work involved in a large distribution system chiefly of a rural nature with voltages from 66 kV downwards. Ability to speak Welsh would be an additional advantage.

The appointment will be superannuable and subject to medical examination.

Applications should be made on forms obtainable from the Manager, No. 4/5 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, Near Wrexham, Denbighshire, and should be completed and returned to him so as to be received not later than 8th January, 1951.

JAMES RANKIN, Secretary.
6650

LONDON ELECTRICITY BOARD

Engineers (Construction)

APPLICATIONS are invited for the following positions in the Construction Branch of the Chief Engineer's Department in Central London:—

(a) ENGINEER (Construction) to supervise erection at various bulk supply sub-station sites within the Board's Area, of heavy electrical plant, including transformers and switchgear, at working pressures of up to 66 kV, together with all auxiliary equipment. Applicants must have had previous experience of this work, both in the factory and in the field. Corporate membership of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers would be an advantage.

(b) ENGINEER (Construction) to supervise the laying, jointing and testing of underground cables, within the Board's Area, for working pressures up to 66 kV. Previous experience of such work and of the handling and checking of cable contracts is essential. Corporate membership of the Institution of Electrical Engineers will be an advantage.

Pending grading of the posts under the revised agreement of the National Joint Board, the provisional salaries will be from £650 per annum inclusive in each case, dependent upon qualifications and experience.

Application forms obtainable from the Establishments Office, 46, New Broad Street, London, E.C.2, on receipt of addressed foolscap envelope, to be returned duly completed by 29th January, 1951. Please quote ref. EST/V/1094/R. on envelope and all correspondence. 6620

MUNICIPALITY OF SINGAPORE

Electricity Department

ASSISTANT DISTRICT ENGINEER, Electricity Department, Singapore Municipality, is required for Permanent Staff. Qualifications: Graduate I.E.E. and experience electricity distribution.

Basic salary scale $440-$870 per month. Starting point according to qualifications and experience. Graduated scale of allowances, e.g., present allowances on $530 p.m. basic are: Expatriation $110 p.m. plus cost-of-living $186 p.m. for single man or $235.50 for married man or $301.50 for married man with family. One Malayan dollar equals 2s. 4d. Thus a married man with family on basic salary of $530 p.m. would draw equivalent of £1,318 per annum.

Quarters with heavy furniture provided at 8% of salary or allowance in lieu. Initial appointment on three years' agreement; 8 months' leave after 4 years' service. Free medical attention. Passages paid, including family (children under 17). Compulsory provident fund contributions of 7½% of salary and Municipal Commissioners donate 7½% rising to 20% after 20 years' service.

Applications in duplicate, with full personal and technical information and copies of three testimonials, to Messrs. Peirce & Williams (Agents to the Municipal Commissioners), 1, Victoria Street, London, S.W.1, before 23rd January, 1951. 6659

NORTH WESTERN ELECTRICITY BOARD

No. 5 Sub-Area

Appointment of First Assistant District Engineer, Blackburn District

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT ENGINEER in the Blackburn District of the No. 5 Sub-Area, at a salary in accordance with the revised National Joint Board Schedule, Class F, Grade 4, i.e., £767-£785-£803 per annum.

The person appointed will be required to generally assist the District Engineer in the construction, operation and maintenance work on the high and low voltage overhead and underground networks and sub-stations in the District, including the preparation of schemes and estimates for such system extensions as are dealt with by the District staff, and to deputise for the District Engineer in his absence. Applicants should have had a wide experience of these duties on supply systems preferably up to and including 33 kV.

Preference will be given to applicants who are Members or Associate Members of the Institution of Electrical Engineers.

Applications, stating age, education, qualifications and experience, present post and salary, should be received by R. H. Harral, M.I.E.E., M.Inst.F., Sub-Area Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, not later than Saturday, 6th January, 1951. 6653

SOUTHERN ELECTRICITY BOARD

No. 3 (Portsmouth) Sub-Area

APPLICATIONS are invited for the following appointments in the Portsmouth Sub-Area Office:—

ASSISTANT ENGINEER (Construction). University degree or equivalent qualification is essential. Duties to assist the Sub-Area Construction Engineer in the installation and maintenance of plant equipment, overhead lines and cables by direct labour and for contract at pressures up to 33 kV.

Provisional salary £570 per annum, subject to adjustment by the appropriate negotiating machinery, with N.J.B. conditions of service.

MAINS DRAUGHTSMAN. Experienced in the preparation of overhead line specifications from surveyors' profiles, mains plans, records, etc.

Provisional salary £450 per annum, subject to adjustment by the appropriate negotiating machinery. Conditions of service as prescribed from time to time.

The successful candidates for the above vacancies will, if eligible, be required to contribute to the B.E.A. and Area Boards Superannuation Scheme.

Applications on forms to be obtained from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, should be returned to him in envelopes endorsed with the title of the post not later than fourteen days after the appearance of this notice.

F. W. KEMPTON, Secretary.
6635

BRITISH ELECTRICITY AUTHORITY

South Western Division

Power Station Chemist, Newton Abbot Power Station

APPLICATIONS are invited for the position of STATION CHEMIST at Newton Abbot Power Station. Applicants should have a Higher National Certificate in Chemistry as a minimum qualification, and it is essential that they should have had experience in a power station laboratory. Applicants must be familiar with, and capable of taking part in, investigations and performance tests on a variety of plant.

The successful applicant will be responsible to the Station Superintendent at Newton Abbot and will be required to carry out tests, in addition, at the Exeter Power Station.

The salary, which should be regarded as provisional and subject to negotiation with such organisations as are appropriate, will be within the range £565-£593 per annum.

Applications, stating age, qualifications, experience, present position and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26, Oakfield Road, Clifton, Bristol, 8, so as to be received not later than 8th January, 1951.

R. C. BARRETT,
14th December, 1950. Divisional Secretary.
6665

BRITISH ELECTRICITY AUTHORITY

South Western Division

Assistant to the Station Superintendent, Bath Power Station

APPLICATIONS are invited for the appointment of ASSISTANT to the STATION SUPERINTENDENT at Bath Power Station.

Applicants must have had a thorough engineering training and experience in power station operation and maintenance.

The salary will be Class D, Grade 5, £641-£655 per annum; this grading should be regarded as provisional pending confirmation by the National Joint Board.

Conditions of service will be those negotiated by the National Joint Board.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26, Oakfield Road, Clifton, Bristol, 8, so as to be received not later than 8th January, 1951.

R. C. BARRETT,
Divisional Secretary.

14th December, 1950. 6664

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Dumfries and Galloway Sub-Area

Senior Assistant (Commercial)

APPLICATIONS are invited for the appointment of SENIOR ASSISTANT (Commercial) at Sub-Area Headquarters, Marchmount, Dumfries. Applicants should have wide experience of the utilisation of electricity for domestic, agricultural and commercial purposes, and also of hire and hire-purchase transactions, street lighting contracts, supervision of service centres, publicity and display, organisation of exhibitions and demonstrations.

Salary and conditions in accordance with the National Joint Council Agreement, Grade 6, £630 × £25 — £705 per annum.

Applications, stating age, present position and full details of experience, to be sent to the undersigned within 14 days of the appearance of this advertisement.

W. H. WILLS,
Manager.

Marchmount, Dumfries.
16th December, 1950. 6658

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the positions of FIRST ASSISTANTS to the District Commercial Managers in District 342 (Merthyr) and District 350 (Bridgend) in the Central Sub-Area of the Board.

Preference will be given to applicants who possess the Higher National Certificate in Electrical Engineering or its equivalent, and who have had experience in the commercial operations of a District.

The salary for the positions will be in accordance with Class E, Grade 5 (£662/£678/£694) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments Section), South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than 6th January, 1951.

D. G. DODDS, Secretary.

6622

LONDON COUNTY COUNCIL

South East London Technical College, Lewisham Way, S.E.4

REQUIRED as soon as possible, a LECTURER IN ELECTRICAL ENGINEERING. Salary in accordance with the Burnham Technical Scale, £300 × £15 — £555, with addition for graduate qualification and training, plus London allowance (£36 or £48). In fixing the commencing salary, increments will be given for approved industrial and/or teaching experience. The scale is subject to revision as from April, 1951.

Application forms (stamped addressed foolscap envelope required) from the Secretary of the College, to be returned by 6th January, 1951. (1669) 6633

CROWN AGENTS FOR THE COLONIES

ELECTRICAL FITTER required by the Nyasaland Government Electrical Services Department for one tour of 24 months to 36 months, with prospect of permanency. Commencing salary according to age and experience in scale £570 rising to £865 a year. Cost-of-living allowance between £20 and £126 a year according to salary and dependants. Outfit allowance £30. Free passages. Liberal leave on full salary.

Candidates, under 35, must have served an apprenticeship to electrical engineering with a firm of manufacturers or an electricity supply undertaking, and possess some theoretical knowledge. They should be capable of erecting and maintaining low tension and high tension switchgear, transformers, motors and generators, and should have had some experience of overhead or underground distribution work. Preference will be given to candidates who have had experience of electrical supply in a rural area. Some experience of electric welding an advantage.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M.25647B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. 6619

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division: Clerk of Works

APPLICATIONS are invited for an appointment as CLERK OF WORKS, to be located in the first instance at either Thornhill or Huddersfield Power Stations.

Applicants should have had a sound experience in heavy building work. The appointment will be permanent and subject to the provisions of the Authority's Superannuation Scheme.

Conditions of service and salary will be in accordance with the National Joint Board Agreement, Grade 8, Schedule C. The commencing salary will be within the range £437-£569 per annum, depending upon qualifications and experience, rising ultimately to a maximum of £622 per annum.

Forms of application may be obtained from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement. Envelopes to be endorsed "Clerk of Works."

G. A. VOWLES, Divisional Controller.

6609

EAST MIDLANDS ELECTRICITY BOARD

Spalding District

APPLICATIONS are invited from suitably qualified candidates for the post of GENERAL ASSISTANT ENGINEER in the Spalding District of the Lincolnshire Sub-Area.

Applicants should have had experience in all branches of distribution work and appropriate technical qualifications will be an advantage.

The salary will be in accordance with the Revised National Joint Board Schedule, Class C, Grade 9 (£466-£484 per annum) and the appointment will be superannuable under the terms and conditions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, giving full particulars of qualifications and experience, should be submitted to the Manager of the Spalding District, Flax Mill, Pinchbeck, Spalding, so as to reach him not later than the 15th January, 1951.

P. H. DE KEYSER, Secretary.

6652

LONDON COUNTY COUNCIL

Paddington Technical College

REQUIRED as soon as possible, a SENIOR LABORATORY TECHNICIAN for the Engineering Laboratory. Applicants should preferably have had experience in the maintenance of electrical machines or other plant.

Salary £275-£20-£355 per annum.

A successful candidate who holds or obtains the City and Guilds Final Certificate in laboratory technology or approved equivalent qualification will be paid on the scale £315-£20-£415.

Application forms are obtainable from the Secretary at the College, Saltram Crescent, London, W.9, and should be returned as soon as possible. (1642) 6634

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Appointment of Third Assistant Engineer (Buildings)

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER (Buildings) in the Construction and Planning Section at No. 2 Sub-Area Headquarters, Sandiway, near Northwich, at a salary in accordance with the revised National Joint Board Agreement, Class K, Grade 10, £646/£674 per annum.

The appointment will be superannuable and subject to medical examination.

The duties of the post include the supervision of new building work and the maintenance of existing buildings throughout the Sub-Area. Preference will be given to applicants who hold a Higher National Certificate in Building and who have had experience as a Clerk of Works.

Forms of application may be obtained from the Manager, No. 2 Sub-Area, Merseyside and North Wales Electricity Board, Sandiway House, near Northwich, Cheshire, and should be returned to him in an envelope endorsed "Third Assistant Engineer" so as to be received not later than 8th January, 1951.

JAMES RANKIN, Secretary.
6651

URGENTLY REQUIRED FOR THE MIDDLE EAST

POWER STATION CHARGE ENGINEERS urgently required by major oil company for service in the Middle East. Applicants must hold at least Higher National Certificate in Electrical Engineering and have had not less than three years' experience in the operation of large modern Steam Power Stations with thorough knowledge of the routine operation of water-tube boilers, turbo-alternators, E.H.T. switchgear and auxiliary plant. Present position in this country should be not less than Grade 8a, Class H, or Grade 8, Class G, on N.J.B. Scale. Age not over 35 years. Married accommodation available. Commencing salary not less than £900 per annum, plus an allowance in the local currency which is liable to variation but which at the present time is equal to £1,400 per annum. Free passages out and home, free medical attention, kit allowance, good leave arrangements, excellent pension scheme. Write, giving age, personal particulars and full details of qualifications and experience, quoting Dept. F.189, to Box 2549, at 191, Gresham House, E.C.2. 189

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position. The successful applicant will be based on the Sub-Area Drawing Office at Romford Road, Stratford, E.15, but may be required to carry out duties in any District of the North Eastern Sub-Area.

Applicants should have an extensive knowledge of building construction, including design of steel-framed and reinforced concrete structures, and be capable of surveying and levelling of sites for sub-station and other buildings.

Pending grading of the post under the national agreement of the appropriate negotiating body, the commencing salary will be not less than £500 per annum inclusive, according to qualifications and experience.

Application forms obtainable from Establishments Officer, 46, New Broad Street, London, E.C.2, to be returned duly completed by 8th January, 1951. Please enclose addressed foolscap envelope and quote ref. EST/V/1048/R. on envelope and all correspondence. 6602

PLATING chemist; representatives (full or part-time) plating industry; television/radio service engineers; radar mechanics; electronics wiremen, testers, assemblers, etc.; radio/radar, television development engineers; telephone engineers; progress; ratefixers; electrical engineers, B.Sc.; large number draughtsmen and tracers. Other positions vacant. Write in confidence—Technical Employment Agency, 179, Clapham Road, S.W.9 (Brixton 3487). 6584

APPLICATIONS are invited for a number of vacancies for electrical engineering senior draughtsmen for the installation of electrical equipment in large civil and military aircraft. Some knowledge of electronic equipment is desirable and possession of O.N.C. or H.N.C. (Elect.) preferable. The vacancies are for Cricklewood and Radlett (Herts) drawing offices. Further vacancies exist at Cricklewood only for junior electrical engineering draughtsmen for detailing the above work. The positions offer excellent opportunities for advancement to keen men. Write, stating age and full details of experience and qualifications, to—Staff Officer, Handley Page Ltd., Cricklewood, London, N.W.2. 6632

A VACANCY exists with a well-known Midlands engineering company for young engineers to assist in the preparation of tenders and contracts for hydro-electric plant. Preference will be given to qualified engineers with practical training in this field. Apply, quoting ref. GEF and giving full details, to—Box 6607.

AIR Ministry have vacancies for designer/draughtsmen in the Designs Branch of the Works Department in mechanical and electrical engineering. Vacancies are mainly in London but there are some in the provinces. If desired, consideration would be given to making appointments for London only. Salaries are on ranges up to £625 with starting pay in accordance with age and qualifications. Applications, stating age, qualifications, previous appointments with dates, should be sent to—Air Ministry (S.2.H.), Cornwall House, London, S.E.1, from which address further details may also be obtained. 6144

APPLICATIONS are invited for the position of power station supt. at the Trading Estate Power Station, Slough. Applicants must be fully qualified engineers, having had adequate technical education and practical experience in the administration, operation and maintenance of a steam generating station. The post is a permanent one with a contributory pension scheme. A house will be made available. Salary in accordance with E.P.E.A. Schedule, commencing at £935 per annum. Applications, with particulars of training and experience and copies of recent testimonials, to be addressed to the Chief Engineer, Slough Estates Ltd., Trading Estate, Slough. 6636

APPLICATIONS are invited for the post of assistant inspector to the Ceylon Fire Insurance Association in Colombo. Applicants should have had comprehensive training in electrical engineering, embracing a five years' apprenticeship, and general experience in installation work, particularly in connection with wiring for lighting and power, and possess a sound general knowledge of mechanical engineering and building construction. Some experience of automatic sprinkler installations would be an advantage. Candidates should be about 30 years of age, unmarried, well educated and of good address. Applications and enquiries to the Secretary, Fire Offices' Committee (Foreign), 65 Watling St., London, E.C.4. 9335

ASSISTANT electrical engineer/draughtsman required immediately. O.N.C. or equivalent in elec. eng. Experience in general elec. installation design desirable. Salary within scale £450-£600. Reply in writing, giving age, qualifications and experience, to—Norman & Drawbarn, 5, Gower St., London, W.C.1. 6639

ASSISTANT electrical maintenance foreman required for large factory near Manchester. Must have had wide experience with installation and maintenance of large industrial power and lighting systems, H.T. and L.T., A.C. and D.C. Knowledge required of modern distribution systems using P.I.L.C., T.R.S. and V.I.R. cables, also servicing of machine control equipments, including automatic and electronic gear. Must have adequate technical training in addition to practical experience, be fully conversant with electricity regulations, and used to controlling and getting adequate output from considerable numbers of men. Salary to start will average about £11 per week. Applications to be made in writing, stating age, qualifications, experience, etc., marking envelopes "Maintenance," to—Box 6536.

ASSISTANT engineer, aged about 26 to 30 and having completed apprenticeship, required in London sales office. Knowledge of switchgear an advantage. Reply, giving details of experience and salary required, to—Box 6605.

ATTRACTIVE staff vacancies for draughtsman exist at Chelmsford and in London with Marconi's Wireless Telegraph Co. Ltd. Continued expansion of the company's work calls for increased D.O. output, and electrical or mechanical draughtsmen are invited to apply for these permanent staff positions on the design and development of radio and radar equipment. Vacancies also exist for young men of at least O.N.C. standard as trainee draughtsmen. Write, giving full details, quoting ref. 142B, to—Central Personnel Services, English Electric Co. Ltd., 24-30, Gillingham St., London, S.W.1. 6550

CABLE foreman required immediately, London area, for 33-kV cable laying and take charge gang. Must have wide experience. State age, salary expected, details of experience and references to—Employment and Welfare Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7. 6626

CABLE manufacturers require technical assistants in their construction department, age 20/25. Applicants must at least have qualified to Ordinary National Certificate standard in electrical engineering or its equivalent. Also required, junior draughtsman, age 25, with some electrical engineering experience. Apply in writing, giving particulars of qualifications and experience, to—Staff Officer, Milton Court, Dorking, Surrey. 6640

CHLORIDE BATTERIES Ltd. require an electrical engineer (age 24-30) for work in connection with emergency lighting and power equipment. A university degree or Higher National Certificate in the manufacture and/or testing of electrical equipment essential. Salary in accordance with age, qualifications and experience. Apply—Personnel Manager, Exide Works, Clifton Junction, Nr. Manchester. 6553

CIVIL engineers. A number of vacancies occur for assistant site engineers for railway electrification contracts, initially in the Manchester/Sheffield area, but with the probability of overseas work later. Duties include surveying, erection of structures and of overhead line equipment. Candidates should be Civil or Electrical Engineering Graduates, preferably with 2/3 years' post-graduate experience, but this is not essential. Age range approximately 22/26 years. Salary according to age, experience and qualifications. Applications should be addressed to—The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. 6606

CONSULTING engineers require electrical installations designer-draughtsman, experienced in all classes of installation design for schools, hospitals, etc., site supervision, contract preparation and operation. Reply in writing to—A. F. Myers & Partners, 9, Victoria Street, London, S.W.1. 6624

COST clerk required by busy electrical contractors, conversant with pricing stores requisitions, etc. N.W. suburb.—Box 6555.

DESIGNER-draughtsman required by Manchester firm to take charge of drawing office, experienced on switchgear up to 33 kV. State age, qualifications and salary required.—Box 145.

DESIGNERS and technical assistants required in the f.h.p. motor development laboratory of large light engineering company. Applicants must have experience in development of induction and constant speed types of f.h.p. motors. The positions are permanent, pensionable and with excellent prospects. Kindly state full details, including age and salary required, to—Box 6611.

DRAUGHTSMAN having experience in the layout of unit type low tension panels and distribution equipment required. Apply in writing, stating age, experience and salary required, to—The Personnel Officer, W. T. Henley's Telegraph Works Co. Ltd., Gravesend. 6613

DRAUGHTSMAN required, experienced in electrical control gear layouts and diagrams. Applications should state experience, salary required and age to—E. N. Bray Ltd., Wood Street, Walthamstow, London, E.17. 9324

DRAUGHTSMAN required, preferably with experience in the design of fractional to 5-h.p. electric motors. Varied and interesting work. Please write, giving full particulars, to—Personnel Manager, Small Electric Motors Ltd., Churchfields Rd., Beckenham, Kent. 6603

DRAUGHTSMAN, senior, required for metalclad medium-voltage switchgear, with experience of switchgear contracts, and able to work largely on own initiative. Good prospects for man of right type and ability who wishes to work in S. Devon.—Box 6518.

DRAUGHTSMEN with experience on all sizes of power transformers required by company in S.W. London. Pension scheme in operation and five-day week. State full details, past experience, technical education and salary required.—Box 6638.

ELECTRICAL contractors' manager with experience in industrial and domestic installations. State experience, age, salary, etc., in confidence. South Manchester area.—Box 143.

ELECTRICAL draughtsman required by the Bahrein Petroleum Company Limited with minimum 5 years' experience on layout and design of power stations and outside lines, transformers, etc. Should also have had some experience in either mechanical or structural design drawing. Age limits 25-40. Two-year agreements with paid leaves and transportation costs, free air-conditioned accommodation, board and medical attention. Kit allowance. Write with full particulars of age, education, experience, salary required, to—Box 3839, c/o Charles Barker & Sons Ltd., 31, Budge Row, London, E.C.4. 62

ELECTRICAL Engineers required by major British oil company for several months' training in U.K. in power station work for eventual service in the Middle East. Minimum qualifications: Higher National Certificate in Electrical Engineering with one years' industrial experience. A salary is paid while in U.K., together with contribution to cost of living if away from home. Overseas posts offered to successful trainees will carry attractive salary plus a generous allowance in the local currency, free passages out and home, free medical attention, good leave arrangements. Pension scheme. Write, giving personal particulars and details of qualifications and career to date, quoting Department F.198, to Box 2947, at 191, Gresham House, E.C.2. 197

ELECTRICAL engineer of A.M.I.E.E. standard, preferably single, required by a European firm of electrical agents and contractors in West Africa, B.I.C.C. or B.T.H. trained man preferred. Terms £1,200 p.a. plus percentage of profits on contracts; 15 months' coast service, two months' home service, one month's leave. Apply—R. L. T. Jones, 402, Upper Richmond Road, Putney, London, S.W.15 (Telephone, Putney 7423). 6660

ELECTRICIAN wanted for London contractor; must have thorough knowledge of trade. Good prospects for right man. Also mate. Write, stating age, experience, etc., to—Box 6541.

ELECTRICIANS with general contractors' experience; local work; permanent position offered to good men. Apply—Knight's (Hendon) Ltd., 42, Watford Way, N.W.4. 133

ELECTRO-technical engineer, minimum qualification Higher National Certificate, required for senior position in design department. Integrating meter experience very desirable if not essential. Apply, giving full particulars, to—The General Manager, British Electric Meters Ltd., Bangor, North Wales. 6614

ENGINEER with experience in the design and manufacture of electrical control gear wanted in the Manchester district to take charge of a control gear department. Good salary and conditions for the right man.—Box 6516.

ENGINEERS required for development, servicing and instruction on electronic equipment. National Certificate standard. Previous experience on electronics or radar desirable. Remuneration according to experience and qualifications. Apply—Construction Department, The British Thomson-Houston Co. Ltd., Rugby. 6654

ENGLISH ELECTRIC, Stafford, require transformer design engineers for high-power systems in which surge impulse phenomena is a primary consideration. Good engineering qualifications desirable, and practical experience on transformer design problems essential. Write, giving full details, quoting ref. 225D, to—Central Personnel Services, English Electric Co. Ltd., 24-30, Gillingham St., London, S.W.1. 6473

ESTIMATING engineer required by electrical contractors in S.W. London area. Should have had previous experience in industrial and domestic installations. Attractive salary and prospects for keen young man. Write in confidence, stating age, experience and salary required, to—Box 6625.

IF you are between 21 and 25 years of age, and have at least 3 years' electrical or mechanical engineering workshop experience, the English Electric Group are willing to consider you for training as a draughtsman. This paid training will be up to six months' duration to fit suitable applicants for employment as either electrical or mechanical draughtsmen at Acton, Bradford, Chelmsford, Liverpool, Preston, Rugby or Stafford. Preference will be given to men who have reached O.N.C. standard of technical study. Apply, quoting ref. 842, to—Central Personnel Services, English Electric Company Limited, 24/30, Gillingham St., London, S.W.1. 6494

JUNIOR draughtsmen required by well-established company in N.E. London as trainees in both electrical and mechanical categories. Preference will be given to applicants with workshop experience and technical training to O.N.C. standard. Good prospects, five-day week. Write, giving full details of experience, age and salary required, to—Box 6610.

JUNIOR electrical engineer, age 20/25, with regular electrical training and qualifications, preferably Higher National, to train as switchgear sales engineer. Rapidity and extent of advancement will depend on ability of successful applicant.—Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 6642

LONDON area. Switchgear draughtsmen experienced in layout or diagram work. Good conditions and prospects for suitable applicants. State age, experience and salary required, to—Box 6513.

MAN required for testing private automatic telephone exchange equipment during manufacture. Good rates of pay and working conditions.—Box 9349.

MECHANICAL draughtsman for plant and maintenance drawing office. Higher National Certificate or equivalent. Apply in writing, stating age, experience and salary required, to—The Personnel Officer, W. T. Henley's Telegraph Works Co. Ltd., Gravesend. 6612

METER tester and repairer, D.C. and A.C., single and polyphase. London S.W. district.—Box 137.

NEON sign erector required. Must be skilled electrician and willing to travel.—Electra, 256, Terminus Rd., Eastbourne. 6604

SENIOR and junior draughtsmen required by leading company of fluorescent lighting fittings manufacturers. Applicants should have sound electro-mechanical experience, and possess ability to work on own initiative with minimum supervision. Please write, giving details of experience, qualifications, etc., to—Box A.E.192, Central News Ltd., 17, Moorgate, London, E.C.2. 6661

PRODUCTION engineer required by manufacturing electrical engineers, Johannesburg. Good salary and commission. Progressive position. Would prefer applicant take up about 5,000 (£1) shares. Good return.—Box 9327.

SENIOR diagram draughtsmen required in London with experience of H.T. switchgear and modern power station practice. When applying, please state age and experience.—Box 48.

SWITCHGEAR engineer for head office, Manchester, to handle enquiries and orders for power and sub-station equipment. Previous switchgear experience essential. Write, giving full details of technical qualifications and experience, to—Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 6643

TECHNICAL assistant to works manager, rubber cable works, Lancashire, capable of supervising all technical processes and inspection.—Box 6641.

TELEPHONE plumber-jointers required for contract work. Apply by letter, giving details of experience, etc., to—Telecommunications Department, Pirelli-General Cable Works Ltd., Leigh Rd., Eastleigh, Hants. 6537

THOMAS LOCKER & Co. Ltd. have vacancies for a limited number of college apprentices taking or about to take engineering courses at a recognised university. The company's products find wide application in the mining, quarry, chemical, food and other processing industries, and the training given to successful applicants will be comprehensive with a view to fitting them for senior positions. Apply by letter in the first instance, stating age and full particulars, to the Personnel Officer, Mersey Works, Napier St., Warrington, from whom full details may be obtained. 6644

TRADE counter assistant experienced wholesale electrical trade. Write stating experience, wages required, etc.—L. M., Sloan Electrical Co. Ltd., 31/33, Bondway, London, S.W.8. 6488

TRANSFORMER draughtsmen required by Hackbridge and Hewittic Electric Co. Ltd. at Walton-on-Thames, Surrey, one having experience on transformers up to 2,000 kVA and one having experience up to 100,000 kVA. Pension scheme. Five-day week. Write, giving age, experience and salary required, to—Chief Draughtsman (Transformers). 6637

YOUNG engineer, aged about 24 yrs., required at special English Electric Company laboratory. B.Sc. or at least H.N.C. Experience in theory, calibration and testing of small hydraulic pumps, motors and similar equipment, for investigation and research relating to aircraft systems. Work entails both calculation and practical laboratory experiments. Progressive post, commencing salary £400/£500 p.a. Apply, giving full details and quoting ref. 491, to—Central Personnel Services, English Electric Co. Ltd., 24/30, Gillingham St., London, S.W.1. 6662

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

BOX 6069—Engineer; Box 6211—University Graduate. All applicants are thanked. Manufacturers of electrical mechanical mining and industrial equipment who advertised for a sales manager under Box 5780 wish to thank all applicants.

SITUATIONS WANTED

ELECTRICAL engineer (40), National Certificate. Good organising ability. Wide electrical-engineering background, including electronics and induction heating. Responsible situation required, sales, service, development or similar.—Box 9329.

ELECTRICIAN (46), installation and maintenance, A.C. and D.C., 20 yrs. foreman, desires change.—Box 9334.

ENG. Grad. (24), linguist, travelled, studying sales management, 3 years' elect. industry, reqs. post sales eng., willing be trained, go abroad.—Box 9318.

GENTLEMAN, experienced trade association work, desires change. Age 40, degree economics, linguist, good war record. Used to positions of trust and dealing with high executives.—Box 9345.

FOR SALE

FOR SALE—ALTERNATORS

BRAND new, 400/230 volts, 3-phase, 50 cycles, 4-wire. Up to 50 kilowatts.

HORSESHOE SUPPLY CO. (SPALDING) LTD.
Horseshoe Road, Spalding
(Phone 2535). 6539

STEAM-DRIVEN GENERATING SETS

7,500-kW turbo-alternator by BRITISH THOMSON-HOUSTON, of the impulse type with a 2-stage Curtis wheel and 7 impulse stages, fitted with stainless steel and bronze blading and designed for use with steam at 180/200 lb. sq. in., 550/574° F. temperature exhausting to a vacuum of 28 in., speed 3,000 r.p.m., and direct coupled on combined baseplate to 9,400-kVA alternator: .8 power factor, 6,300/6,600/3/50, with exciter. The surface condenser by W. H. Allen has cooling surface of 15,500 sq. ft. and is fitted with special brass tubes. Motor-driven Circulating Pump and Condensate Pump are fitted together with 2-stage steam jet air ejection. Auxiliary electric supply is 400/440/3/50.

2,500-kW (3,125-kVA) pass-out turbo-alternator set by HOWDEN/SIEMENS, for 480/3/50, speed 3,000 r.p.m. Steam pressure 195 lb. sq. in., temperature 510° F., passing out 50,000 lb. steam per hr. at 40 lb. pressure. Mirrlees surface condenser and condenser pump.

700-kW geared turbo-alternator set by W. H. ALLEN/CROMPTON PARKINSON, for 440/3/50, 4-wire, 0.8 p.f., speed 6,000/1,000 r.p.m., through reduction gear. Turbines designed for steam at 280 lb. sq. in., 30 lb. back pressure, superheat 50° C., steam consumption 41.7 lb. per kW hr. Alternatively 200 lb. sq. in., 10 lb. back pressure, steam consumption 42 lb. kW hr., then giving max. output of 620 kW. Overhauled by makers 1948. Can be reconnected for 220/3/50.

Two 600-kW (750-kVA) geared turbo-alternator sets by G. & J. WEIR/E.C.C., for 400/440/3/50, 4-wire, speed 4,000/1,000 r.p.m. through David Brown reduction gear. Steam pressure 150 lb. sq. in., 15 lb. back pressure, suitable for pressures up to 190 lb. sq. in. With switchboard and direct coupled exciter.

GEORGE COHEN, SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
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DIESEL ENGINES

169-kVA unused CROSSLEY Model QVD.4, vertical, air start, 500-r.p.m. Diesel Engine, direct coupled to a 169-kVA, 415/240-volt, 3-phase, 50-cycle Alternator, with suitable control panel and air starting equipment.

113-kVA MURPHY 6-cyl., 1,000-r.p.m. vertical radiator-cooled, electric starting Diesel Engine, direct coupled to a 113-kVA, 400/230-volt, 3-phase, 50-cycle Alternator, with suitable control panel and starting equipment.

27.5-kVA LISTER Model 3S/4, vertical, hand start radiator-cooled, 1,000-r.p.m. Diesel Engine, direct coupled to a 400/230-volt, 3-phase, 50-cycle Alternator, with suitable control panel. (Quantity available.)

Many others available.

NEWMAN INDUSTRIES LIMITED
Yate, Bristol
(Phone: Chipping Sodbury 3311). 9325

HOUCHIN DIESELS

A NEW Houchin diesel generator designed and built for hard, continuous work. Ideal as a standard power unit for factories, building works and a host of other uses—or as an emergency reserve unit. Compact, rugged, reliable and fully portable.

100 kVA, .8 power factor, 3 voltages available: 110, 220, 440, 3-phase, 4-wire, 50 cycles, 1,500 r.p.m. G.M.C. diesel engine 6-71 series, 126 h.p. continuously rated. A completely self-contained plant. Available ex stock.

HOUCHIN LTD., Garford Street, London, E.14.
Tel. East 4123 (5 lines). 90

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PAPER-INSULATED, LEAD-COVERED & SERVED to .1.

V.I.R. Cable, 7/064-19/052-19/083.

T.R.S. Single-core, 7/036-19/064-61/103.

J. S. RAMSBOTTOM & CO. LTD.
Bow Street, Keighley
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PAPER-INSULATED LEAD-COVERED CABLE

0.04 4-core P.I.L.C.S.W.A. Cable.

0.04 4-core P.I.L.C. unarmoured Cable.

Any quantities.

BRITANNIA MANUFACTURING CO. LTD.,
22-26, Britannia Walk, London, N.1.
163

A Babcock & Wilcox water-tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap. 200 lb. w.p. Two 25,000 lb. evap. 250 lb. w.p. One 20,000 lb. evap. 175 lb. w.p. Two 16,000 lb. evap. 190 lb. w.p. Two 12,000 lb. evap. 200 lb. w.p. We install complete, including brickwork.—Burford, Taylor & Co. Ltd., Boiler Specialists, Commercial Street, Middlesbrough. Tel. Middlesbrough 2622. 32

A BARGAIN in electric motors can always be obtained from A. Cooksley & Co. Ltd., 21-25, Tabernacle St., London, E.C.2. Tel. Monarch 3357. Stocks at present comprise new squirrel cage motors, 1-25 h.p. also new and secondhand slipring motors, with starters, from 7½ b.h.p. to 30 b.h.p. 50

A.C. and D.C. House, Quarterly and Prepayment Meters. —Electric Meter Co., Castor Rd., Brixham. 9337

A.C. and D.C. House Service Meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High St., S.W.11. Tel. Battersea 0780. 138

A.C. and D.C. Motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Road, East Dulwich, S.E.22. Forest Hill 2278-9. 102

A.C. and D.C. motors, alternators, generators, generating sets, transformers, welders, plating equipment, control gear, switchgear, portable electric tools, etc., etc. Write for current electrical stock list, post free.—Thos. W. Ward Ltd., Albion Works, Sheffield (Phone 26311, ex. 347). 174

A.C. and D.C. Motors, Generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. Edgware 8631-4. 91

A.C. Metrovick B.T.H. Motors, ¼ h.p., 200/250 v., 50 c., 1-ph., 1,425 r.p.m., new, £5 3s.; ½ h.p. £6 2s. 6d.; ¾ h.p. £8 4s. 6d.; 1 h.p., capacitor start, £13 15s.; 1 h.p. £16 5s.; discounts to trade; also 3-phase and D.C. Guaranteed repairs and rewinds.—Johnson Engineering, 310, Kennington Road, London, S.E.11. Reliance 1412-3. 99

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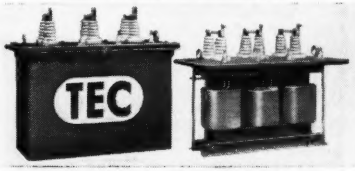

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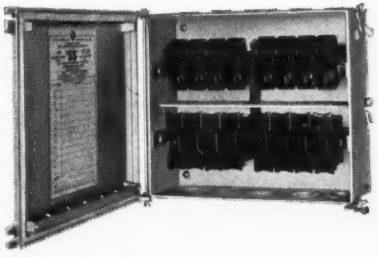

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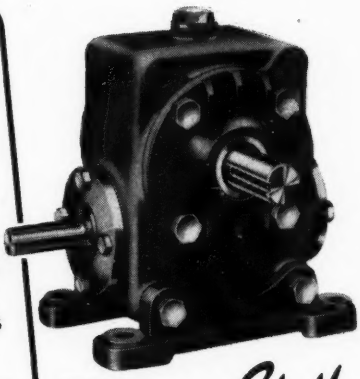

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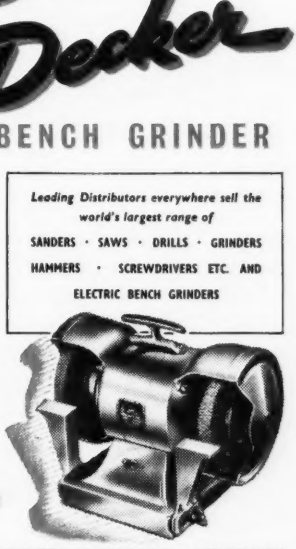

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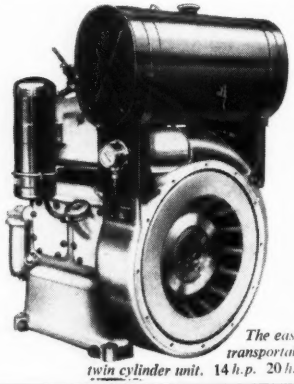

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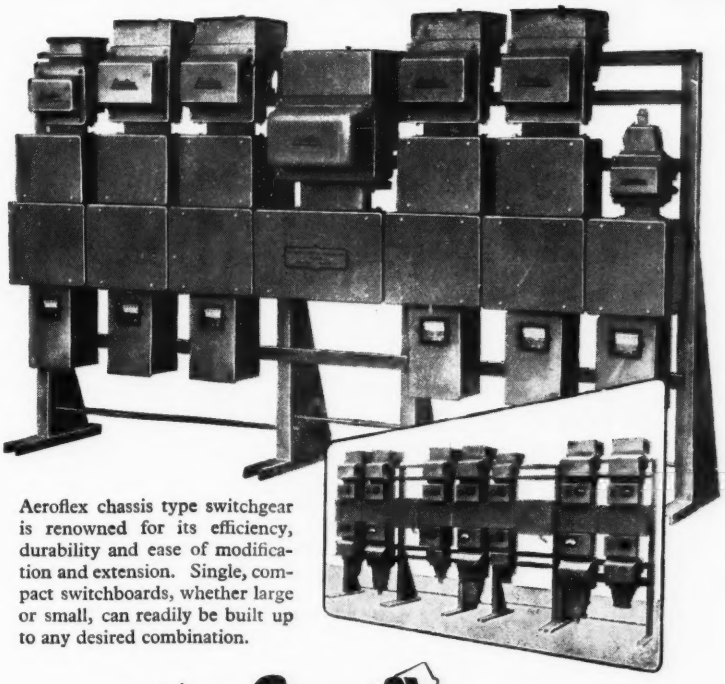

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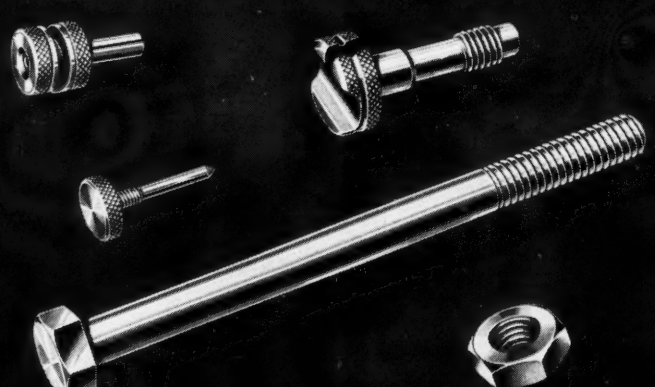

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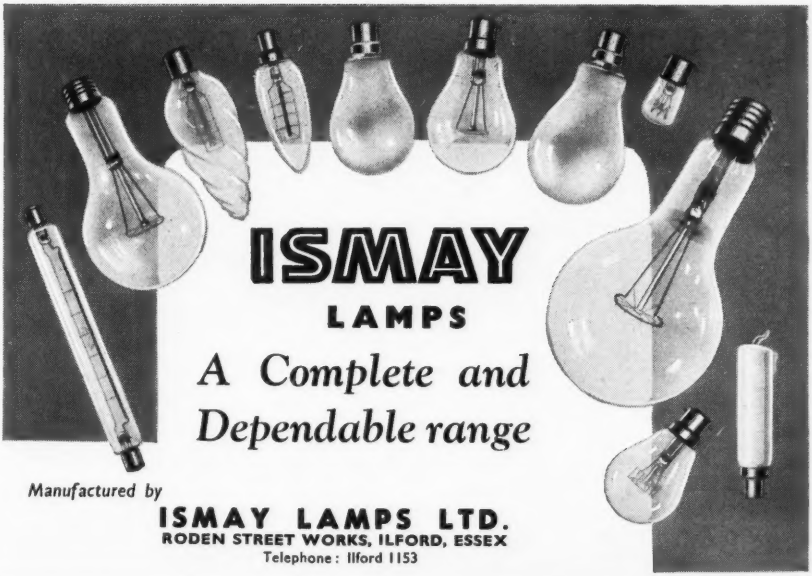

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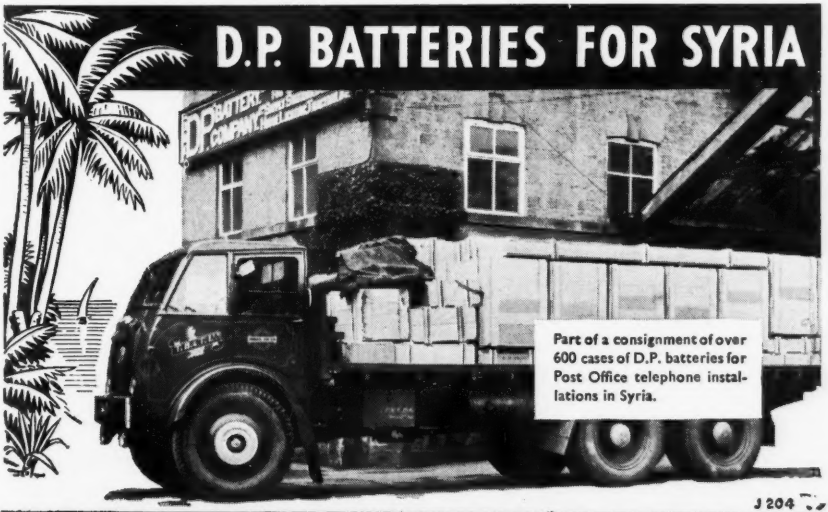

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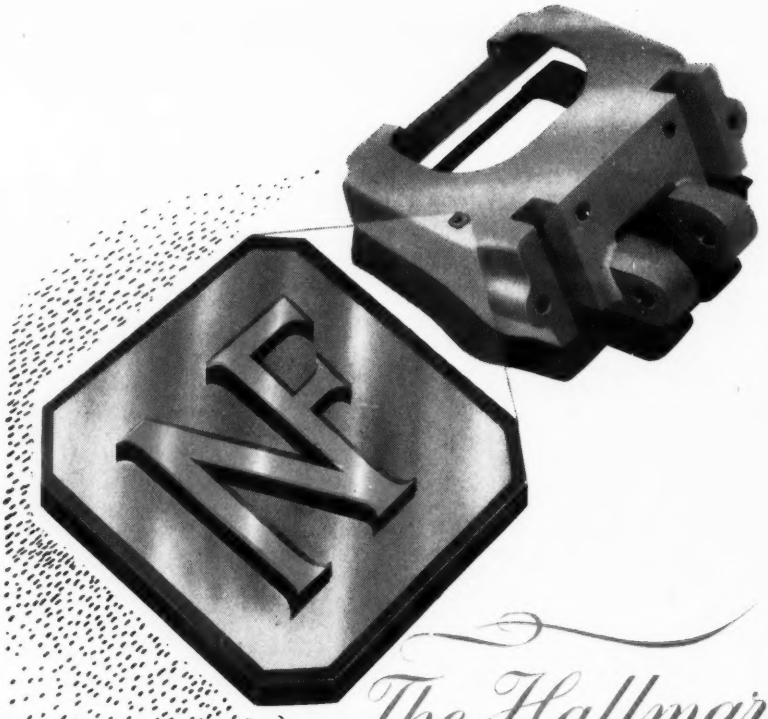

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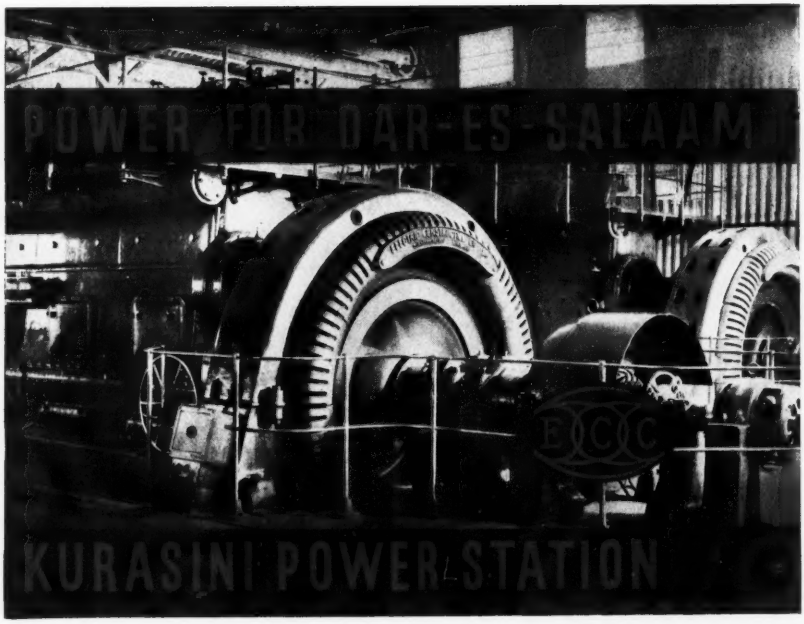

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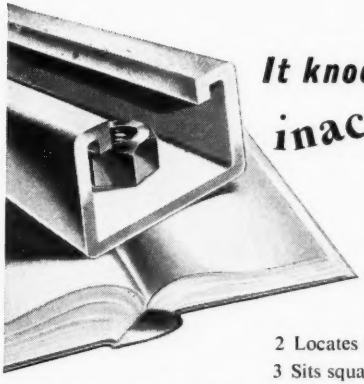

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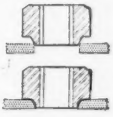

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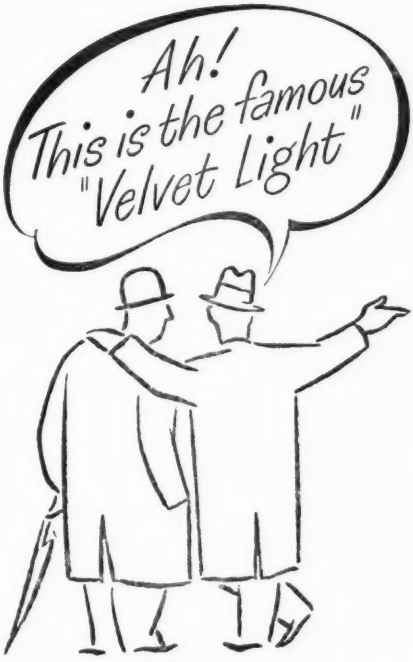

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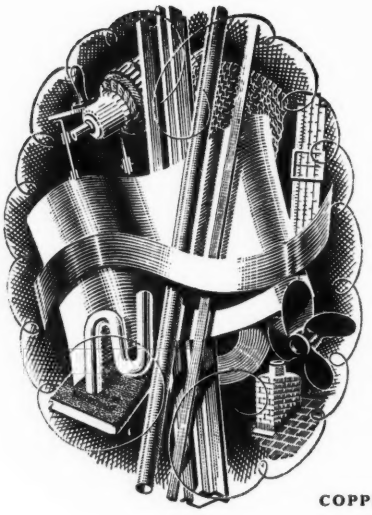

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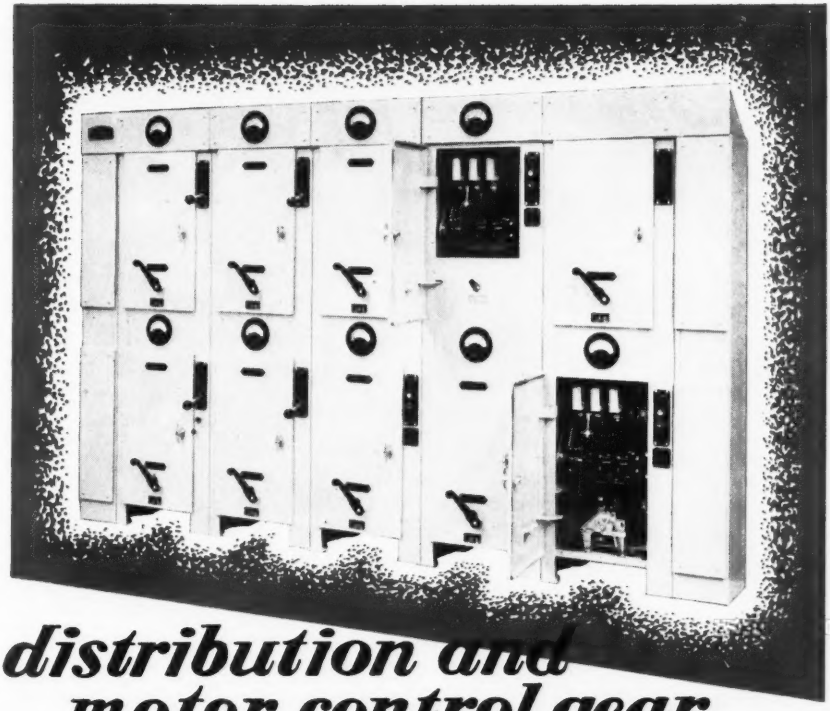

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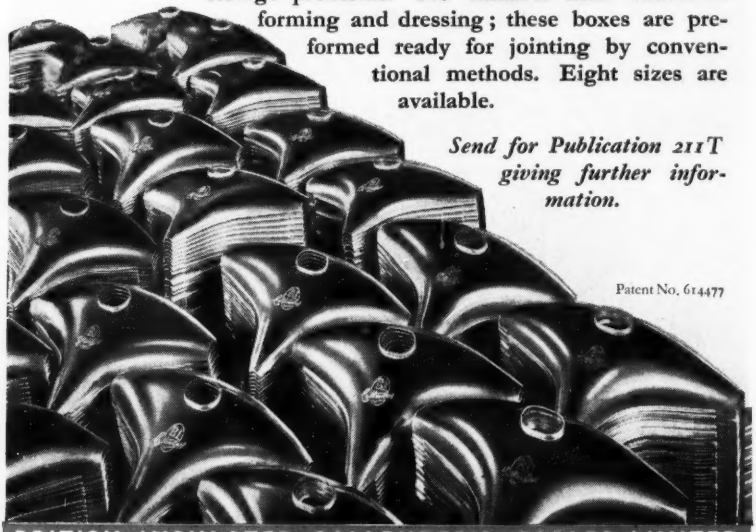

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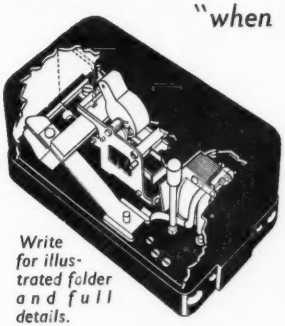

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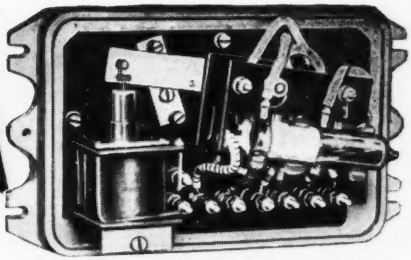

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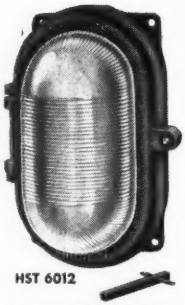

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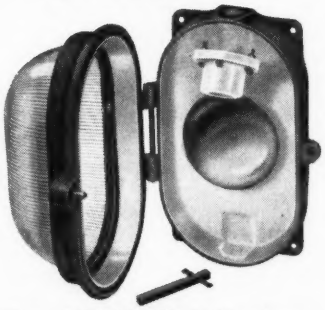

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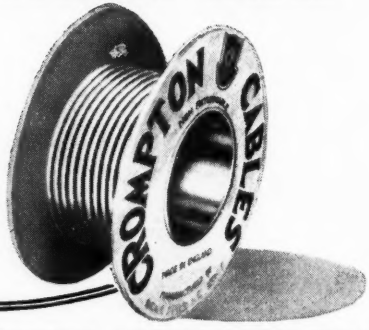

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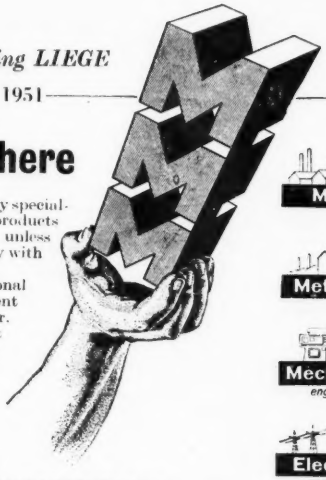

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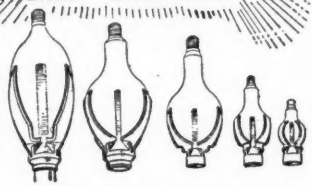

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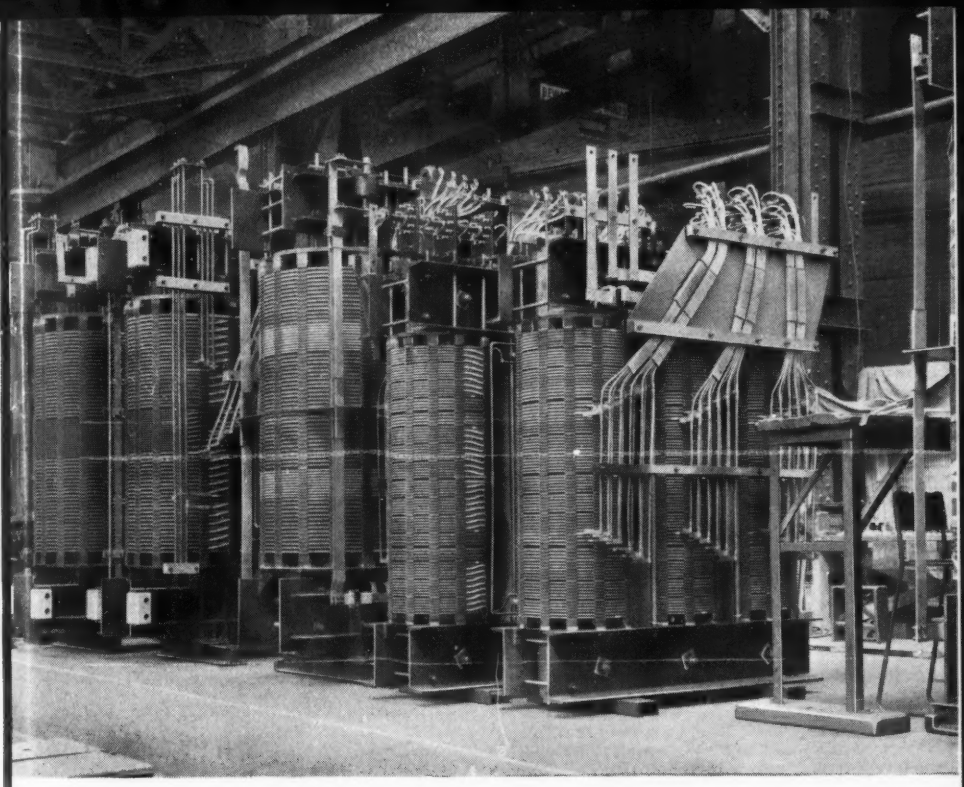

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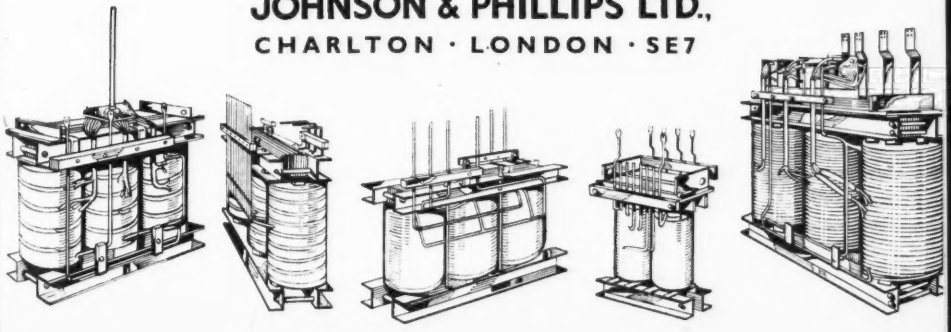

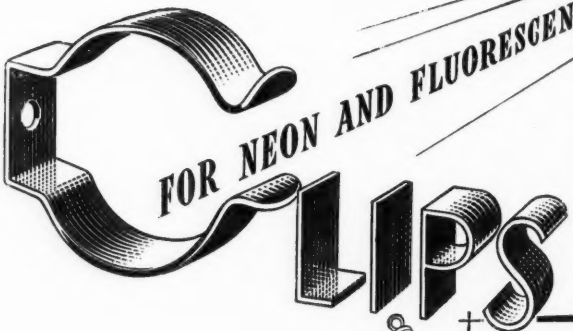

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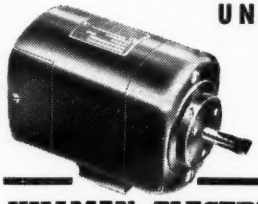

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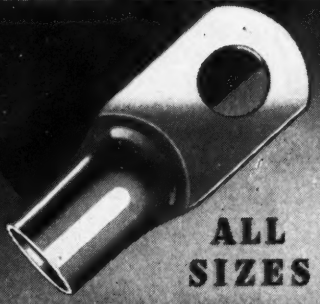

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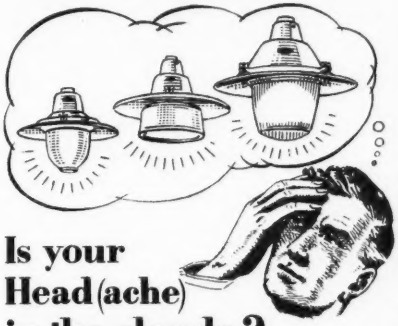

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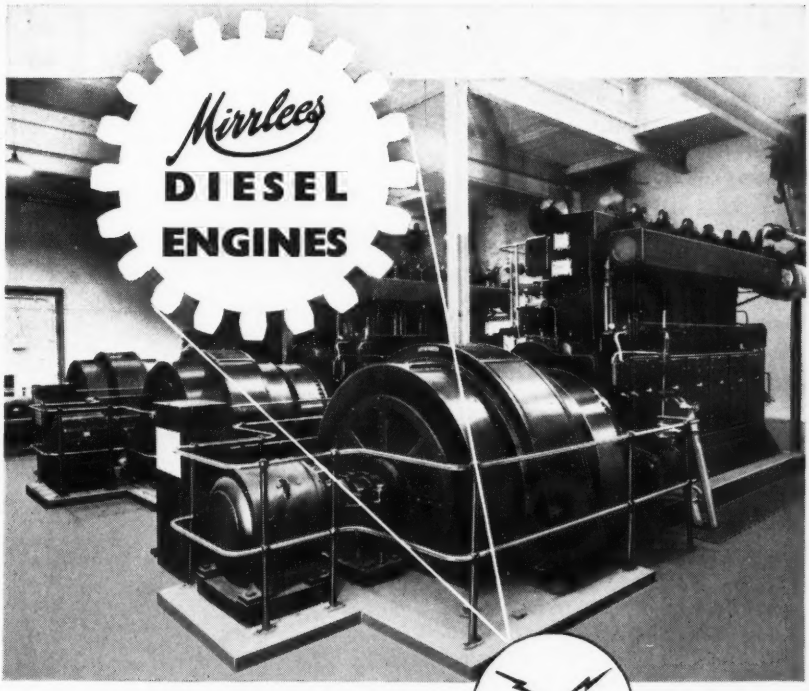

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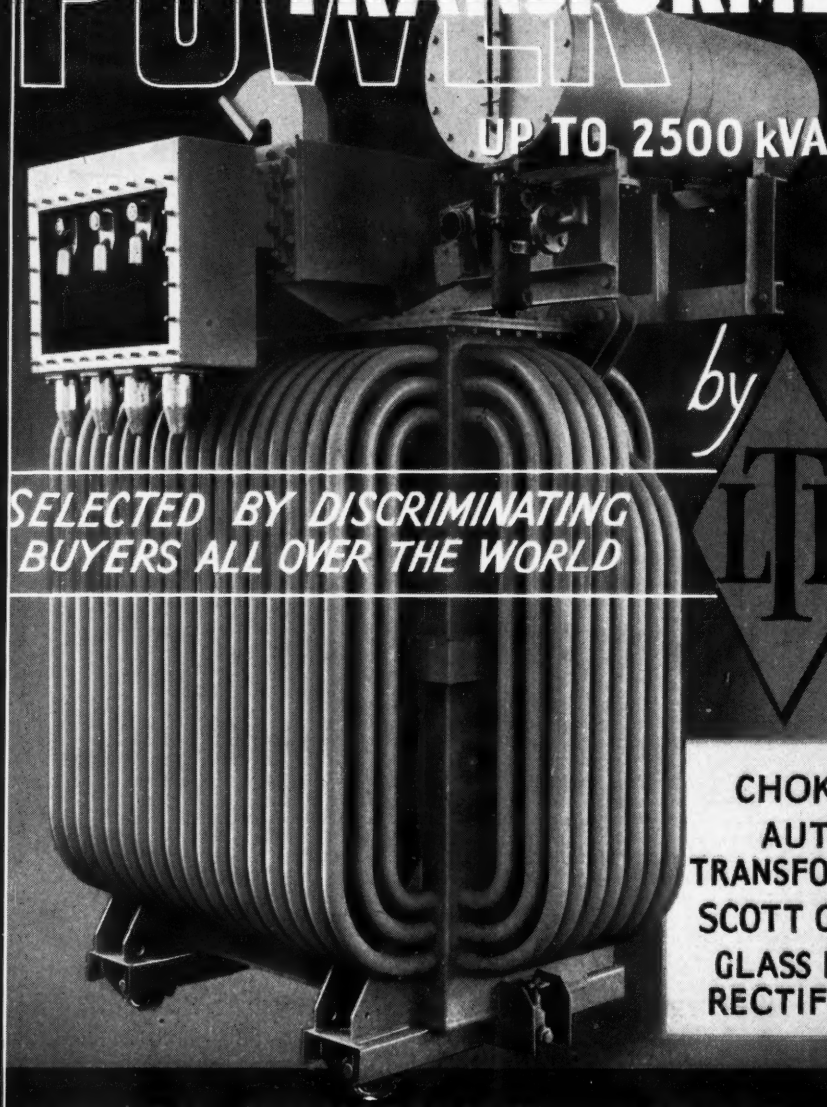

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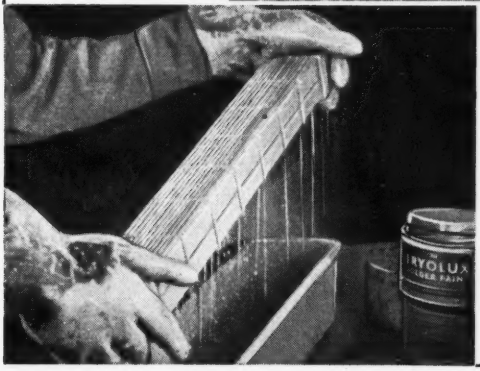

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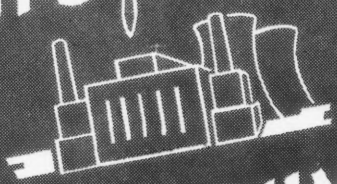

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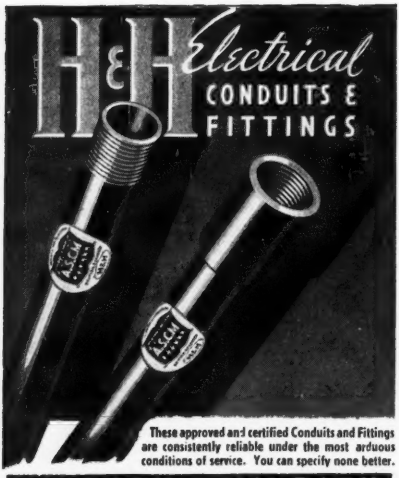
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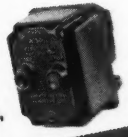

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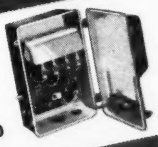

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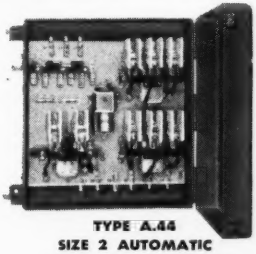

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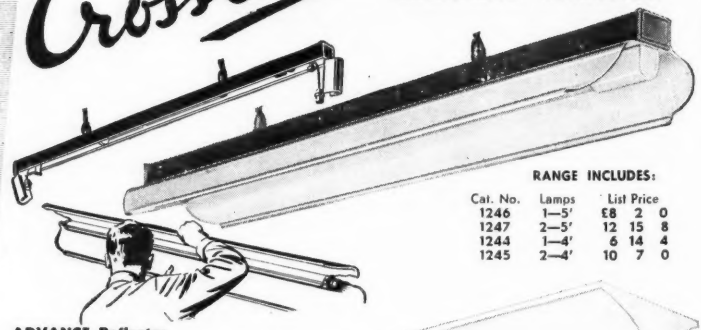

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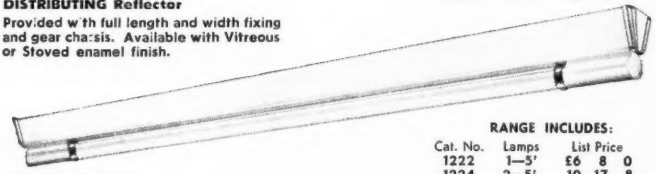

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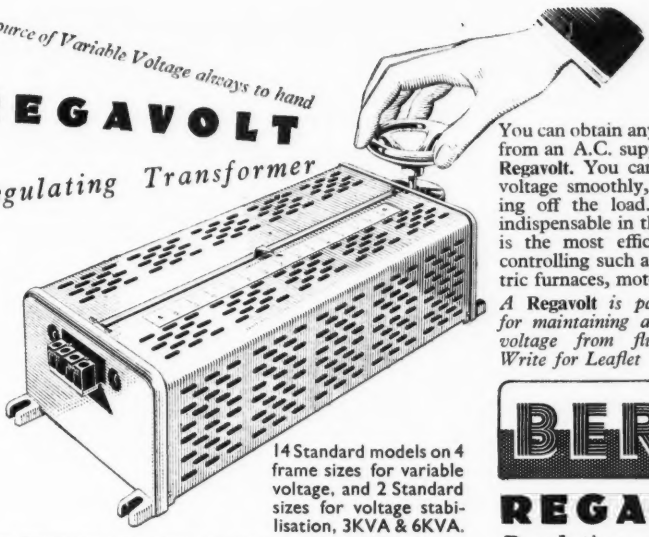

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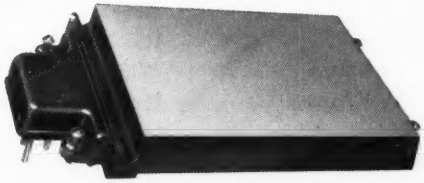

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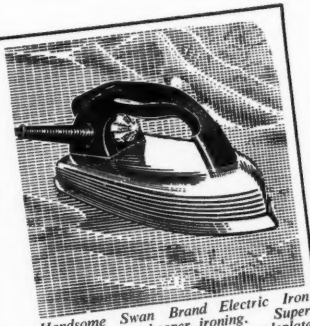

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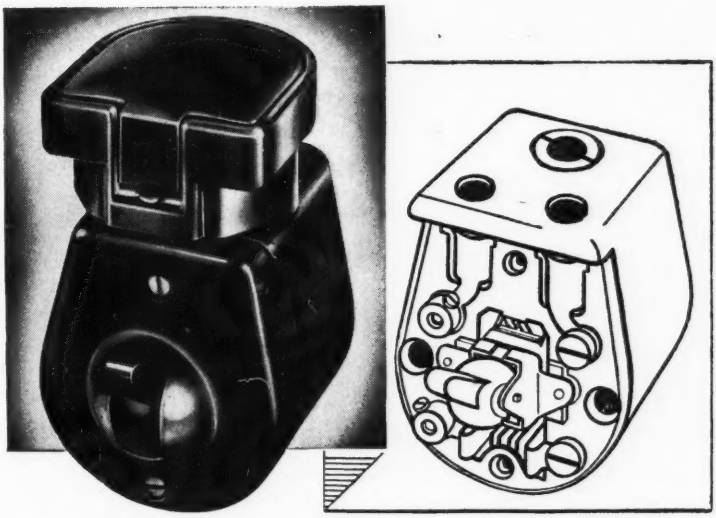

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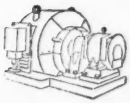

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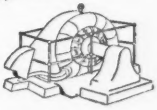

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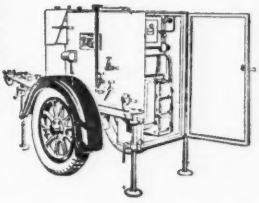

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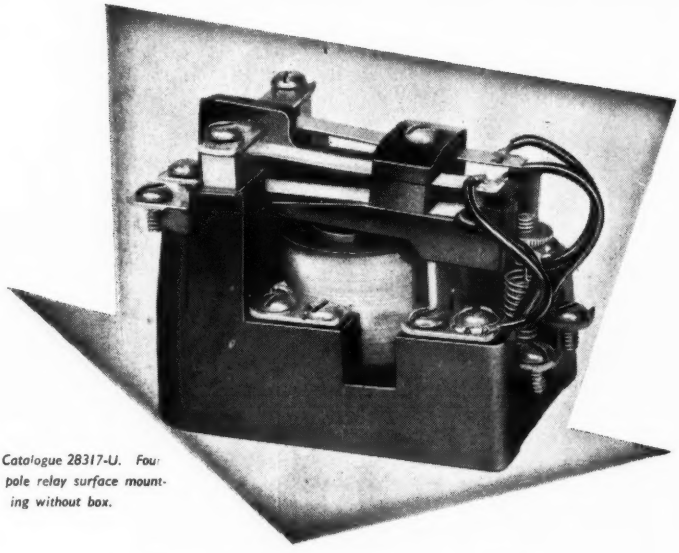

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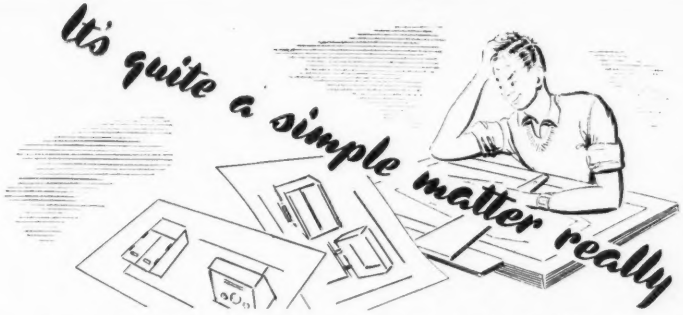

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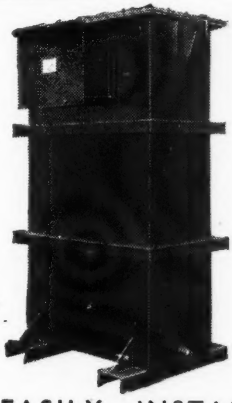

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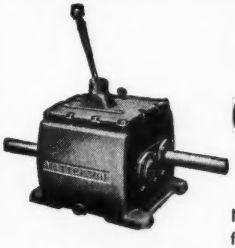

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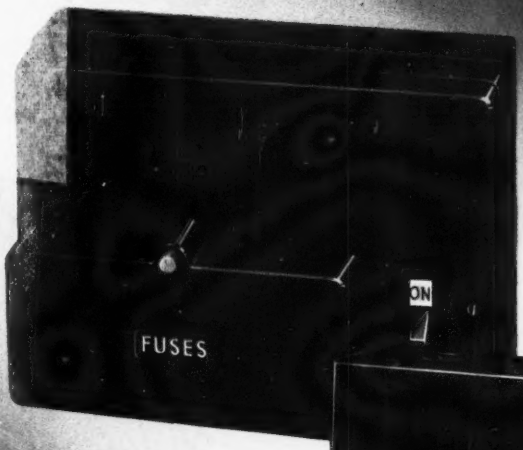

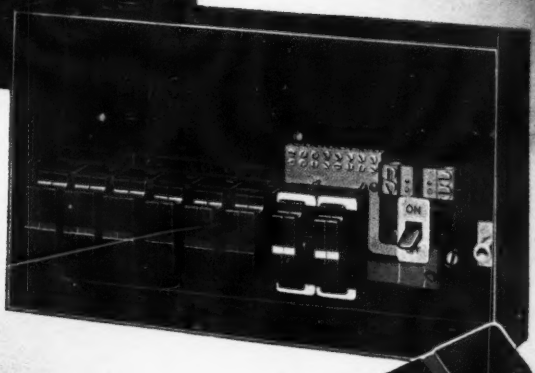

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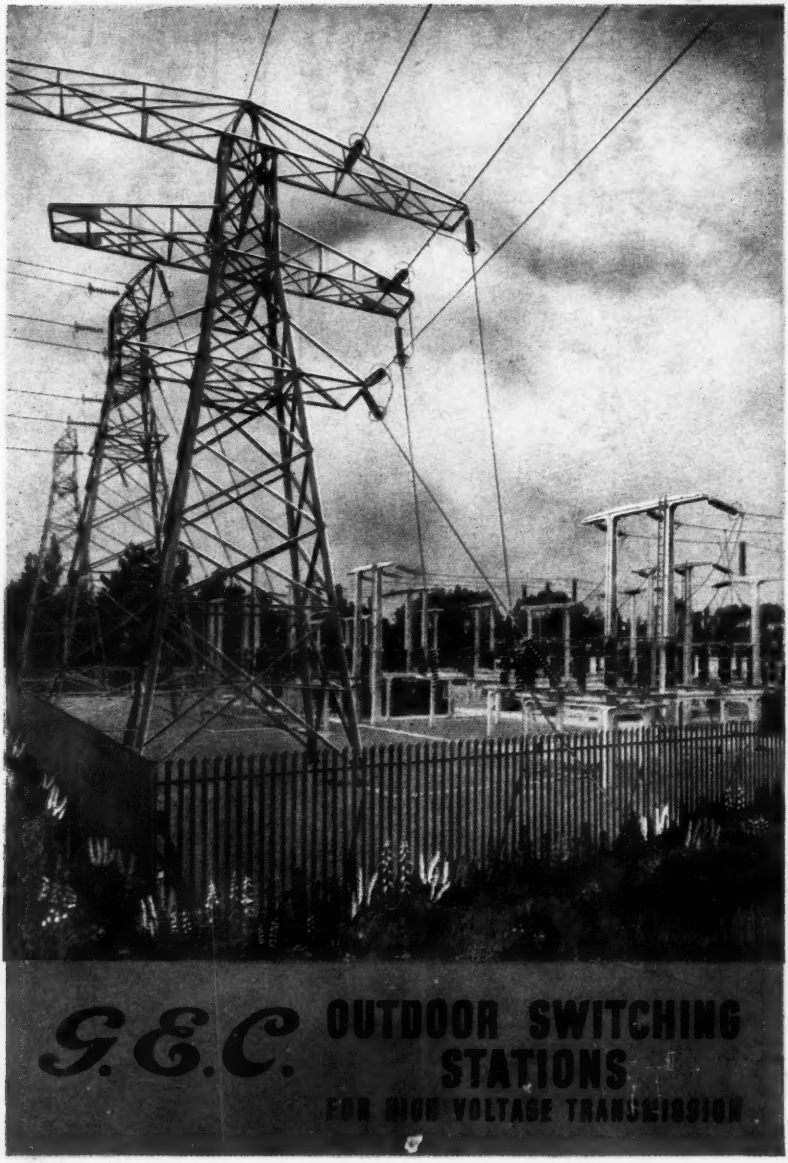

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